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GUIDE TO STRUCTURAL FIRE PROTECTION

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AMENDMENTS

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FOREWARD

This guide is intended to clarify the structural fire protection requirements contained in the various Regulations and Standards. The Regulations and Standards without explanation may not be sufficient for the comprehension of the total scope and intent of the Canadian Coast Guard's structural fire protection requirements. This guide is a clarification and interpretation of the Regulations and Standards, but in no way changes or modifies the applicable regulatory requirements.

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PART 1

DEFINITIONS

Accommodation Spaces

Accommodation spaces include:

- Public spaces
- Corridors and lobbies
- Public washrooms and toilet spaces
- Crew Cabins
- Passenger Cabins
- Offices
- Hospitals
- Dispensaries
- Cinemas
- Games Rooms
- Hairdressing salons and beauty parlours
- Isolated pantries containing no cooking appliances
- Dining rooms
- Lounges
- Shops
- Drying rooms having a deck area of $4m^2$ or less
- Isolated lockers and small storerooms having a deck area of $4m^2$ or less in which flammable liquids are not stowed
- Cleaning gear lockers in which flammable liquids are not stowed
- Laboratories in which flammable liquids are not stowed

'A' Class Divisions

'A' class divisions are bulkheads and decks constructed of steel or other equivalent material, capable of preventing the passage of smoke and flame to the end of the one-hour standard fire test. They are insulated with approved materials such that the average temperature of the unexposed side will not rise more than 139°C above the original temperature, nor will the temperature at any one point, including any joint, rise more than 180°C above the original temperature, within the time listed below:

Class "A-60"	60 minutes
Class "A-30"	30 minutes
Class "A-15"	15 minutes
Class "A-0"	0 minutes

'A' Class Fire Doors

The construction of all doors in 'A' Class bulkheads and the means of securing

them when closed should provide resistance to fire as well as to the passage of smoke and flame, as far as practicable, equivalent to that of the bulkheads in which the doors are situated. 'A' Class fire doors should be constructed of steel or other equivalent material.

Approved Materials

Approved materials are those which have been approved by the Board of Steamship Inspection and meet the test criteria described in the publication, TP439, "Structural Fire Protection Standards: Testing and Approval Procedures". A listing of all Canadian Coast Guard approved structural fire protection materials is contained in the publication TP438, "Structural Fire Protection Standards: List of Approved Products".

'B' Class Divisions

'B' Class divisions are bulkheads, decks, ceilings and linings constructed of approved non-combustible materials, capable of preventing the passage of flame to the end of the first half-hour of the standard fire test. They have an insulation value such that the average temperature of the unexposed side will not rise more than 139°C above the original temperature, nor will the temperature at any one point, including any joint, rise more than 225°C above the original temperature, within the time listed below :

Class "B-15"	15 minutes
Class "B-0"	0 minutes

'B' Class Fire Doors

The construction of all doors in 'B' Class bulkheads and the means of securing them when closed should provide resistance to fire as far as practicable equivalent to the bulkheads in which the doors are situated. 'B' Class fire doors should be constructed of approved non-combustible materials.

'C' Class Divisions

'C' Class divisions are bulkheads, decks, ceilings and linings constructed of approved non-combustible materials, which have no requirements relative to the passage of smoke and flame nor the limiting of temperature rise.

'C' Class Doors

'C' Class doors are the type of doors required to be fitted in 'C' Class bulkheads. They must be constructed of approved non-combustible materials.

Cargo Spaces

Cargo spaces are all spaces used for cargo including cargo oil tanks and any trunks leading to and from such spaces.

Ceilings

Ceilings are horizontal divisions fitted near the deckhead of a space for the purpose of decoration, acoustics or fire protection.

Combustible Materials

Combustible materials are materials which do not meet the criteria for non-combustibility.

Continuous 'B' Class Ceilings and Linings

Continuous 'B' Class ceilings and linings are those ceilings and linings which terminate only at a 'A' or 'B' Class division. Continuous 'B' Class ceilings may be used in lieu of fitting 'B' Class bulkheads deck to deck in accommodation and service areas.

Control Stations

Control Stations include:

- Spaces containing emergency sources of power and lighting, including battery rooms
- Spaces containing the ship's radio equipment
- Spaces used for the storage of smothering gas
- Wheelhouse and chart rooms
- Control rooms for propelling machinery when located outside the propelling machinery spaces
- Spaces containing fire control and recording equipment
- Spaces containing the operating controls for sprinkler and water deluge systems
- Spaces containing the emergency fire pumps
- Spaces containing the main navigation equipment
- Spaces containing centralized emergency public address system stations and equipment.
- Trunks leading to and from the above spaces.

Dead End Corridors

Dead end corridors are passageways from which there is only one route of escape.

Draft Stops

Draft stops are divisions installed between ceilings or linings and the ship's structure. The purpose of draft stops is to prevent the spread of smoke and flame in concealed spaces.

Fire Dampers

Fire dampers are devices fitted to vent ducts that penetrate 'A' Class bulkheads and decks, in order to maintain the fire integrity of the division and to prevent the spread of smoke and flame to adjacent compartments through the ventilation system.

Fire Integrity

Fire integrity is the basic fire-resisting ability of a bulkhead or deck to remain intact during a specified period, ie., 60 minutes for 'A' Class and 30 minutes for 'B' Class.

Furnishings

Furnishings are the contents of a room, such as desks, chairs, draperies, carpets, etc.

Intumescent Coatings

Intumescent coatings mean coatings which when heated are subject to a chemical reaction called intumescence. This causes the coating to form into a multi-cellular barrier which acts as a partial fire-shield. Intumescent coatings are not structural fire insulations.

Low Flame Spread Characteristics

Low flame spread characteristics means that the surface described will adequately restrict the spread of flame and has been approved by the Canadian Coast Guard as having successfully passed the tests described in TP439, "Structural Fire Protection Standards: Testing and Approval Procedures."

Machinery Spaces of Category "A"

Machinery spaces of category "A" are spaces and trunks to such spaces which contain internal combustion machinery used for main propulsion, internal combustion machinery for purposes other than main propulsion where such machinery has in the aggregate a total power output of not less than 375kW, or any oil fired boiler or oil fuel unit.

Machinery Spaces

Machinery spaces include:

- Machinery spaces of category 'A'
- Spaces containing propelling machinery
- Boiler spaces
- Spaces containing fuel oil units, steam or internal combustion machinery
- Spaces containing generators or electrical motors and auxiliaries (spaces containing the emergency source of power are considered control stations)
- Oil fuel filling stations
- Spaces containing refrigeration machinery
- Spaces containing ventilation and air conditioning machinery
- Spaces containing steering gear machinery
- Spaces containing stabilizing machinery
- Trunks leading to and from the above spaces

Main Vertical Zones

Main vertical zones are sections into which the hull, superstructure and deckhouses are divided by 'A' Class divisions the mean length of which on any one deck does not in general exceed 40 metres. Where main vertical zoning is not practicable as in special category spaces, equivalent protection must be obtained on the basis of a horizontal zone concept.

Methods of Fire Protection

In cargo ships, three methods of fire protection are permitted, namely IC, IIC and IIIC. Detailed requirements for each of the three methods are described in Part X of the Hull Construction Regulations.

Non-Combustible Materials

Non-combustible materials are materials approved by the Board of Steamship Inspection that have successfully passed the non-combustibility test described in TP439, "Structural Fire Protection Standards: Testing and Approval Procedures"

Public Spaces

Public spaces are those spaces in accommodation areas that are used for dining rooms, lounges, recreation rooms, libraries and similar enclosed spaces.

Penetrations

Penetrations are openings made in bulkheads or decks to allow the passage of pipes, electric cables and ventilation ducts. For the purpose of structural fire protection, these openings must be protected to maintain the fire integrity of the bulkhead or deck.

Ro-Ro Cargo Spaces

Ro-ro cargo spaces are spaces not normally subdivided in any way and extending to either a substantial length or the entire length of the ship in which goods (packaged or in bulk), in or on rail or road cars, vehicles (including road or rail tankers), trailers, containers, pallets, demountable tanks or in or on similar stowage units or other receptacles that can be loaded and unloaded normally in a horizontal direction.

Rooms Containing Furniture and Furnishings of Restricted Fire Risk

Rooms containing furniture and furnishings of restricted fire risk are those rooms (whether cabins, public spaces, offices or other types of accommodation) in which:

(a) all case furniture such as desks, wardrobes, bureaux, dressers, is constructed entirely of approved non-combustible materials except that a combustible veneer not exceeding 2mm may be used on the working surface of such articles;

(b) all free standing furniture such as chairs, sofas,tables is constructed with frames of non-combustible materials;

(c) all draperies, curtains and other suspended textile materials have, qualities of resistance to flame not inferior to those of wool of mass 0.8kg/m^2;

(d) all soft floor coverings meet the test criteria described in TP439,"Structural Fire Protection Standards:Testing and Approval Procedures".

(e) all exposed surfaces of bulkheads, linings and ceilings have low flame spread characteristics; and

(f) all upholstered furniture meets an approved test criteria.

Service Spaces

Service spaces include:

- Galleys
- Pantries containing cooking appliances
- Storerooms
- Workshops (other than those forming part of a machinery space)
- Laundries
- Drying rooms having a deck area of more than 4m^2
- Mail and baggage rooms

- Paint and lamp rooms
- Trunks leading to and from the above spaces

Special Category Spaces

Special category spaces are enclosed spaces above or below the bulkhead deck intended for the carriage of motor vehicles with fuel in their tanks for their own propulsion, into and from which such vehicles can be driven and to which passengers have access.

Stairways

Stairways are vertical means of escape between two decks. A stairway which penetrates only one deck must be enclosed by bulkheads and a door at least at one level. If it is necessary to have a stairway that penetrates more than one deck, a stairtower is to be provided.

Stairtower

A stairtower is an enclosure which provides continuous fire shelter for a stairway penetrating more than one deck.

Steel or other Equivalent Material

Means steel or any non-combustible material that by itself or when insulated has structural and fire integrity properties equivalent to steel at the end of the applicable exposure to the standard fire test.

Structural Fire Protection

Structural fire protection is a means of minimizing the probability of a major fire and the resulting loss of life by designing the structure of the ship to confine any outbreaks of fire to as small an area as possible. This is accomplished by specifying fire endurance capabilities of structural boundaries. Additional items considered are minor bulkheads and penetrations of structural boundaries.

The following basic principles underline the requirements contained in the Regulations and Standards pertaining to structural fire protection:

(a) division of the ship into main vertical zones by thermal and structural boundaries (passenger ships);

(b) separation of accommodation spaces from the remainder of the ship by thermal and structural boundaries;

(c) restricted use of combustible materials;

(d) detection of any fire in the zone of origin;

(e) containment and extinction of any fire in the space of origin;

(f) protection of the means of escape or access for fire fighting;

(g) ready availability of fire extinguishing appliances; and

(h) minimization of possibility of ignition of flammable cargo vapour.

PART 2

SUBMISSION OF PLANS

The following plans are required to be submitted to the Ship Safety Branch to reflect the structural fire protection arrangements of each vessel.

2.1 Fire Zone Plan

2.1.1 The fire zone plan should be in the form of an outline general arrangement drawing, drawn to a scale of not less than 1:100. The regulations being applied and the area of operation should be indicated. Each interior compartment, and exterior decks if designated for the mustering and embarkation of passengers is to be identified by name and classified according to its fire risk into one of the categories described in the tables contained in the applicable regulations. In the case of cargo ships, the method of fire protection which is to be adopted i.e. IC, IIC or IIIC, should be stated on the drawing. Main vertical zone and horizontal zone boundaries should be clearly marked. All bulkhead and deck fire integrity and insulation values are to be shown and the symbols used to indicate such values are to be easily distinguishable. Figure 1 indicates an acceptable method of presenting this information.

2.1.2 This plan should only contain the information described above. Past practice by some shipbuilders and naval architects has been to submit drawings which contain additional information such as installation details of fire insulation, ventilation systems and fire extinguishing equipment. This practice will no longer be accepted. Fire zone plans are not to be confused with fire control plans which are intended for the guidance of ship's officers in a fire emergency.

2.2 Insulation Details

This plan should indicate the location and installation details for all structural fire insulation and other types of insulation fitted, i.e. comfort and acoustic, including details of vapour barriers where fitted. Each product is to be identified and the methods of installation, thicknesses and other details for each product are to be in accordance with the conditions specified on the relevant certificate of approval issued by the Board of Steamship Inspection.

2.3 Bulkhead, Ceiling, Lining and Draft Stop Details

This plan should indicate the location and installation details of all 'A' Class, 'B' Class, and 'C' Class non-combustible bulkheads, ceilings, linings and draft stops. Each product is to be identified and the methods of installation, thicknesses and other details are to be in accordance with the conditions specified on the relevant certificate of approval issued by the Board of Steamship Inspection.

2.4 Deck Covering Details

This plan should indicate the location and installation details for deck coverings both fire-rated and non-fire-rated. Each product is to be identified and the methods of installation, thicknesses and other details are to be in accordance with the conditions specified on the relevant certificate of approval issued by the Board of Steamship Inspection.

2.5 Ventilation System Details

This plan should indicate the arrangement of the ventilation ducts throughout the vessel. It should also indicate the sizes, construction materials and thicknesses of ducts, the extent and type of fire insulation fitted to ducts, location and details of fire dampers and details of the closing devices for the main inlets and outlets.

2.6 List of Doors

This plan should indicate the location, type, dimensions and fire rating of each 'A' and 'B' Class door or shutter which is to be fitted on the ship and an indication of the doors provided with self-closing and central control releasing arrangements. The names of the manufacturers of the doors and the appropriate certificate of approval number should also be indicated.

2.7 Penetration Details

This plan should indicate the detailed arrangements when 'A' Class bulkheads and decks and 'B' Class bulkheads, ceilings and linings are penetrated by pipes, electric cables and ventilation ducts.

2.8 General

2.8.1 The "Fire Zone Plan" should be submitted via a Regional Office to

Headquarters for approval. The remaining plans listed above should be submitted to the appropriate Regional Office for their approval.

2.8.2 Plans should contain all the requisite data, clearly substantiate compliance with the regulations and should be submitted prior to construction or installation.

2.8.3 Any plans submitted which are determined to be incomplete or significantly at variance with the regulations will be returned to the submitter unapproved and without detailed comments. The submitter will however be referred to the appropriate regulations and requested to resubmit the plans.

2.8.4 Surveyors should ensure that the texts of all drawings and specifications are legible and in the English or French language or adequate translations are provided.

PART 3

MATERIALS OF CONSTRUCTION

3.1 General

3.1.1 All approved structural fire protection materials for use on Canadian registered ships are listed in TP438, "Structural Fire Protection Standards: List of Approved Products". In order for a product to be listed as "approved" it must first be tested in accordance with the applicable test procedure described in TP439, "Structural Fire Protection Standards: Testing and Approval Procedures". After successful testing, and approval of the manufacturer's installation drawings (where required), a certificate of approval will be issued by the Board of Steamship Inspection and the product listed in TP438.

3.1.2 Methods of construction and installation of such materials must be strictly in accordance with those described in the certificate of approval and shown on the manufacturer's approved drawings. No departure will be permitted without the prior consent of the Board of Steamship Inspection.

3.2 Non-Combustible Materials

3.2.1 One of the basic principles of the Coast Guard's structural fire protection philosophy is that the material from which the vessel is constructed should not add to the fuel load available for combustion.

3.2.2 This requires that the majority of materials of construction within the accommodation and service spaces be non-combustible and must successfully pass the tests described in TP439, "Structural Fire Protection Standards: Testing and Approval Procedures" except for certain materials which are known to be inherently non-combustible. The following materials fall under this category and are accepted without testing:

(a) sheet glass, block glass, clay, ceramics and uncoated glass fibres;

(b) all metals except magnesium and magnesium alloy;

(c) portland cement, gypsum and magnesite concretes having aggregates of sand, gravel, expanded vermiculite, expanded or vesicular slags, diatomaceous silica, perlite or pumice;

(d) woven, knitted or needle punched glass fabric containing not more than 2.5% lubricant.

3.3 Structural Fire Insulations

3.3.1 The basic element of bulkhead and deck construction is steel plate. Without additional insulation, steel plate of the required thickness suitably stiffened can be classified as an A-0 or B-0 division. Structural integrity, however, is not the sole parameter upon which the structural fire protection system is dependent. To prevent the spread of fire by radiant or conducted heat, some structural divisions must also act as insulators to prevent the transmission of heat to the unexposed side of the bulkhead or deck.

3.3.2 There are basically three ways to achieve this insulating capability on bare steel:

(a) application of an approved structural fire insulation;

(b) application of an approved bulkhead or ceiling panel; or

(c) a combination of (a) and (b) above.

3.3.3 Materials which have been approved only for use as an insulation for 'A' Class bulkheads should not be used as an insulation for 'A' Class decks and vice versa.

3.3.4 Structural fire insulations are to be tested in accordance with the tests for 'A' Class bulkheads and decks described in TP439, "Structural Fire Protection Standards: Testing and Approval Procedures".

3.4 Bulkhead, Lining and Ceiling Panels

3.4.1 Generally, bulkhead, lining and ceiling panels are constructed of non-combustible binder board or steel faced mineral wool. These panels may be used in the construction of 'B' Class bulkheads, ceilings and linings or as components in 'A' Class bulkheads and decks when tested in accordance with the tests described in TP439, "Structural Fire Protection Standards: Testing and Approval Procedures".

3.5 Deck Coverings

3.5.1 Deck coverings fall into two categories, fire rated and non-fire-rated. Fire rated deck coverings are materials which have been approved for use as an insulation material in the construction of 'A' Class decks. Non-fire-rated deck coverings consist of two types, primary and surface. Primary materials are normally in the form of an underlay applied directly to the

deck plating and are used for levelling and smoothing. Surface materials are the exposed deck covering materials fitted for decorative purposes. TP439, "Structural Fire Protection Standards: Testing and Approval Procedures" describe the test requirements for both fire-rated and non-fire-rated deck coverings.

3.5.2 Soft floor coverings such as carpets which are fitted in corridors, stairways and spaces containing furniture and furnishings of restricted fire risk require to be tested in accordance with TP439, "Structural Fire Protection Standards: Testing and Approval Procedures.

3.5.3 Soft floor coverings which are fitted in spaces other than the type described above should be to the satisfaction of the local surveyor who must satisfy himself that the material fitted does not constitute a hazard.

3.6 Interior Finish Materials

3.6.1 The interior finish applied to shipboard compartments is important because the spread of flame and the generation of smoke is dependent upon the properties of the interior finish materials.

3.6.2 In passenger ships the following surfaces are to have low flame spread characteristics:

(a) Exposed surfaces of bulkheads, linings, and ceilings in corridors and stairway enclosures;

(b) Exposed surfaces of bulkheads, linings, and ceilings in all accommodation spaces, service spaces and control stations.

(c) Surfaces in concealed or inaccessible spaces in accommodation spaces, service spaces and control stations.

3.6.3 In cargo ships and tankers the following surfaces are to have low flame spread characteristics:

(a) Exposed surfaces of bulkheads, linings and ceilings in corridors and stairway enclosures;

(b) Exposed surfaces of ceilings in accommodation spaces, service spaces and control stations;

(c) surfaces in concealed or inaccessible spaces in accommodation spaces, service spaces and control stations.

3.6.4 The above requirements do not apply to furniture, furnishings, machinery and similar items except where required by a specific regulation e.g. The Towboat Crew Accommodation Regulations.

3.6.5 Where surfaces are required by the regulations to have low flame spread characteristics, they should be tested in accordance with TP439, "Structural Fire Protection Standards: Testing and Approval Procedures".

3.6.6 Where exposed surfaces of ceilings are required to have low flame spread characteristics plastic light diffusers may be fitted in way of ceiling mounted light fittings provided the fitting is enclosed in a steel housing. The total surface area of the plastic diffusers in any one space should not exceed 20% of the total ceiling area.

3.7 Vapour Barriers

3.7.1 Where insulations are exposed to oil and oil vapours they should be faced with a vapour barrier of impervious material such as aluminum foil or plastic film. Any joints should be sealed with a tape of compatible material having a minimum width of 50mm. Details of and the method of applying the vapour barrier material should be shown on the plan of insulation details described in Part 2. In no case where a vapour barrier is fitted should the expanded metal used to secure 'A' Class insulation be dispensed with.

3.7.2 Where there is a risk of an 'A' Class insulation becoming damaged by the shipping or unshipping of machinery or similar operations, then the vapour barrier should be protected by a metal sheathing. The metal sheathing should be attached to the structure independently of the 'A' Class insulation with a gap of at least 25mm and the number and size of the means of securing the metal sheathing should be kept to a minimum. Figure 2 shows an acceptable method of installing the metal sheathing but any other similar method of attachment may be considered.

3.8 Combustible Materials

3.8.1 In passenger ships, the total volume of combustible facings, mouldings, decorations and veneers in any accommodation and service space should not exceed a volume equivalent to a 2.5mm thick veneer on the combined area of the walls and ceilings.

3.8.2 In cargo ships and tankers, non-combustible bulkheads, linings and ceilings fitted in accommodation and service spaces may have a surface combustible veneer not exceeding 2mm in thickness within any such space, except corridors and stairway enclosures where the veneer should not exceed 1.5mm in thickness.

PART 4

CONSTRUCTION AND ARRANGEMENT

4.1 General

4.1.1 The effectiveness of structural fire protection is dependent upon each material or fitting being properly fitted and erected in the approved manner so that each 'A' or 'B' Class division is an effective barrier against fire.

4.1.2 Poor workmanship or lack of attention to detail, particularly with respect to boundaries and intersections of 'A' and 'B' Class divisions and penetrations through such divisions, may result in a fire breaking through a division in a very short period of time.

4.2 'A' Class Insulations

4.2.1 'A' Class bulkheads

4.2.1.1 'A' Class bulkheads were originally required on passenger vessels for "fire resisting" boundaries described as main vertical zones, spaced at intervals of 40 metres. Currently, 'A' Class boundaries are also required to contain fires in high fire hazard areas such as machinery spaces, galleys and cargo spaces in passenger ships, cargo ships and tankers. 'A' Class bulkheads are also required to protect spaces such as control stations and stairway enclosures.

4.2.1.2 'A' Class bulkheads, in some locations, are required to have insulating capabilities. There are four types of 'A' Class bulkheads, each type being alpha-numerically designated to indicate its fire integrity and insulation value, i.e., A-60, A-30, A-15 and A-0.

4.2.1.3 'A' Class bulkheads are constructed of steel or other equivalent material. Subject to any additional requirements for watertight or load bearing structures, the minimum scantlings required for steel and aluminum alloy 'A' Class bulkheads should be derived from the following tables and notes.

4.2.1.4 Scantlings of 'A' Class bulkheads should not be less than those derived from the following tables and notes since these are based on the minimum scantlings of the bulkhead specimens which are used to test 'A' Class insulations. If bulkheads of lesser scantlings were to be used, the insulations may not achieve the 'A' Class standards for which they were approved.

4.2.1.5 Steel 'A' Class bulkheads

Stiffeners spaced 760mm

Stiffener Span	Plating Thickness	Geometrical Properties in Conjunction with Plating 610mm x Thickness	
Metres	Millimetres	Moment of Inertia (I) cm^4	Section Modulus (I/Y) cm^3
2.4	4.0	87.5	12.0
2.7	4.5	130.0	17.0
3.0	5.0	175.0	22.0
3.3	5.5	237.5	27.0
3.6	6.0	305.0	32.0

(a) The spacing of stiffeners should not normally exceed 760mm;

(b) Where swedges are used to stiffen 'A' Class bulkheads the spacing should not exceed 760mm.

(c) Where stiffeners are spaced other than 760mm apart, the stiffness and strength should be increased or decreased in direct proportion to their spacing.

4.2.1.6 Where 'A' Class bulkheads are constructed of aluminum alloy, they should have equivalent strength, stiffness and efficiency to that of steel bulkheads having the same length or unsupported span.

4.2.1.7 The following table gives the ratios which may be used to obtain these equivalent values:

Plating thickness aluminum alloy	1.4 x thickness of steel of plating
Modulus (I/Y) of aluminum alloy stiffeners	2.35 x Modulus (I/Y) of steel stiffeners
Inertia (I) of aluminum alloy stiffeners	2.8 x Inertia (I) of steel stiffeners

4.2.1.8 An insulation for an 'A' Class bulkhead should cover the whole area of the division and adjacent structures as indicated in paragraph 4.2.10 except that it may terminate on top of the expanded metal or equivalent fitted over the insulation incorporated in an 'A' Class deck covering of the same or higher 'A' Class standard provided that the 'A' Class deck insulation is fitted tightly to the bulkhead plating as shown in Figure 3. However when an insulated 'A' Class bulkhead terminates at the tank top or bottom shell plating, the insulation should terminate 380mm above the tank top or bottom shell plating to prevent the insulation absorbing any oil or water which may be on the tank top or bottom shell plating. The lower edge of the insulation should terminate at a flat bar welded to the bulkhead as shown in Figure 4.

4.2.1.9 Any pipe penetrations situated in the bulkhead below the flat bar need not be insulated provided that the penetrations are constructed in accordance with paragraph 4.2.13 .

4.2.1.10 Any cable penetrations situated in the bulkheads below the flat bar need not be insulated except for those which are constructed of heat sensitive materials. These should be insulated in accordance with the conditions specified in the certificate of approval as indicated in paragraph 4.2.15.2 and the insulation protected by an oil and oil vapour barrier.

4.2.2 'A' Class decks

4.2.2.1 The insulation of decks for fire protection purposes can be accomplished by two methods. The first method is to insulate the underside of the deck plating with a structural fire insulation and the second method is to apply an approved fire rated deck covering on the upper side of the deck.

4.2.2.2 'A' Class decks, in some locations, are required to have insulating capabilities. There are four types of 'A' Class decks, each type being alpha-numerically designated to indicate its insulating capability, i.e., A-60, A-30, A-15 and A-0.

4.2.2.3 When structural fire insulation is installed it should not terminate at the edge of the deck, but should be carried around the adjacent structure for at least 380mm for steel (450mm for aluminum alloy) to prevent heat transmissions as shown in Figures 5, 6 and 7.

4.2.2.4 If an approved fire rated deck covering is used as the insulating material, care is to be taken for preventing heat transmission. Where the deck covering is penetrated by steel, aluminum or 'B' Class bulkheads or other structures or where it terminates at a boundary such as the ship's side, deckhouse side or casing, the horizontal and vertical structure underneath and adjacent to such penetrations and boundaries are to be insulated for

a distance of 380mm for steel (450mm for aluminum alloy) with an approved 'A' Class fire insulation as shown in Figure 6 and 7.

4.2.2.5 'A' Class decks are constructed of steel or other equivalent material. Subject to any additional requirements for watertight or other load bearing structures, the minimum scantlings required for steel and aluminum alloy 'A' Class decks are to be derived from the following tables and notes:

4.2.2.6 Scantlings of 'A' Class decks should not be less than those derived from the following tables and notes since these are based on the minimum scantlings of the deck specimens which are used to test 'A' Class insulations. If decks of lesser scantlings were to be used, the insulations may not achieve the 'A' Class standards for which they were approved.

4.2.2.7 Steel 'A' Class decks

Beams spaced 760mm

Beam Span	Plating Thickness	Geometrical Properties in Conjunction with Plating 610mm x Thickness	
Metres	Millimetres	Moment of Inertia (I) cm^4	Section Modulus (I/Y) cm^3
2.4	4.0	87.5	12.0
2.7	4.5	130.0	17.0
3.0	5.0	175.0	22.0
3.3	5.5	237.5	27.0
3.6	6.0	305.0	32.0

(a) The spacing of beams should not normally exceed 760mm.

(b) Where beams are spaced other than 760mm apart, the stiffness and strength should be increased or decreased in direct proportion to their spacing.

4.2.2.8 Where 'A' Class decks are constructed of aluminum alloy, they should have equivalent strength, stiffness and efficiency to that of steel decks having the same length or unsupported span.

4.2.2.9 The following table gives the ratios which may be used to obtain these equivalent values:

Plating thickness of aluminum alloy	1.4 x thickness of steel plating
Modulus (I/Y) of aluminum alloy beams	2.35 x Modulus (I/Y) of steel beams
Inertia (I) of aluminum alloy beams	2.8 x Inertia (I) of steel beams

4.2.2.10 An insulation for an 'A' Class deck should cover the whole area of the division and adjacent structures as indicated in paragraph 4.2.10. It should not terminate at a ships side lining or deckhouse side lining or a bulkhead lining except that a œiling which is a component for an 'A' Class deck may terminate at a lining fitted deck to deck which is a component of an 'A' Class bulkhead as shown in Figure 13.

4.2.3 Mineral wool insulations

4.2.3.1 Mineral wool insulations should be stored in dry conditions before use and should be dry when attached to the ships structure.

4.2.3.2 The density of a mineral wool insulation is required to be within the range of ±10% of the density specified by the manufacturer and indicated on the certificate of approval. Surveyors should check from the mass and volume of several slabs or rolls that the density of an insulation lies within this range. A surveyor who finds that the density of an insulation is outside this range should contact Headquarters (AMSDD) for advice on what further action should be taken.

4.2.3.3 Although water does not normally affect the insulating properties of 'A' Class mineral wool insulations it could seriously corrode the steel pins and expanded metal which secures the insulations to the structure. Therefore surveyors should examine insulation which has been soaked with water and if there are any signs of deterioration in the pins and expanded metal then the insulation should be removed, the pins renewed as necessary, the insulation replaced when dry if still in good condition or new insulation fitted, and new expanded metal and spring steel washers fitted over the pins.

4.2.3.4 Insulation fitted in boiler rooms should be examined regularly as similar deterioration may occur due to the high humidity in such spaces.

4.2.4 Securing insulations to structure

4.2.4.1 When mineral wool batts are used as the structural fire insulation, the batts should be fitted tightly against all mating surfaces. Steel pins having a diameter of 3mm and a length of at least 12mm longer than the thickness of the insulation, are to be welded to the steel bulkhead or deck and the insulation impaled on the pins. In the case of aluminum bulkheads and decks, stainless steel pins screwed into aluminum alloy bosses welded to the structure are to be used. Galvanized steel expanded metal mesh sheets, 18 gauge x 38mm are to be placed over the surface of the insulation and held in position by 38mm square or 38mm diameter spring steel washers pressed firmly over the pins. To ensure that the insulation is anchored tightly against the bulkhead or deck the pins are to be spaced at 300mm centres maximum. However, adjacent to stiffeners and exposed ends, the spacing is to be as shown in Figures 10 and 11.

4.2.4.2 As an alternative, surveyors may accept the insulation being secured by means of welded steel pins bent at right angles over the expanded metal mesh, the spring washers being dispensed with provided that the pins are at least 40mm longer than the thickness of the insulation and pins in adjacent rows are bent over in opposite directions. On no account should pins be bent in the same direction since this may result in the expanded metal mesh becoming detached from the insulation. The pins should be bent over at the exposed surfaces of the insulation in order to maintain its thickness and prevent a 'quilted' effect occurring. On aluminum alloy structures, the steel pins should <u>not</u> be bent over at right angles as an alternative method of securing the insulation since the thread in the bosses may be damaged in the process of bending the pins.

4.2.5 <u>Board type insulation material</u>

4.2.5.1 For the purpose of this part, board type insulation material includes panels consisting of mineral wool insulation faced with sheet steel.

4.2.5.2 The density of a board type panel or the core insulation in the case of a panel consisting of mineral wool insulation faced with sheet steel is required to be within the range of ±10% of the density specified by the manufacturer and described on the certificate of approval. Surveyors should check from the mass and volume of the boards or panels that the density of the board or insulation lies within this range. A surveyor who finds that the density of an insulation is outside this range should contact headquarters (AMSDD) for advice on what further action should be taken.

4.2.5.3 Each board type insulation which has been approved as a component of an 'A' Class bulkhead should be fitted deck to deck except that it may terminate on top of the insulating component of an 'A' Class deck covering

as indicated in 4.2.1.8 and as shown in Figures 8 and 12. In no case should the board insulation terminate on any other type of deck covering. Stopping a board type insulation at ceiling level and insulating the bulkhead between the ceiling and the deckhead is acceptable provided the arrangement is as shown in Figure 12.

4.2.5.4 If a tween deck height exceeds the length of an 'A' Class board insulation the length of the board may be increased by butt strapping an extension board of the same material to it, the joint between the boards being tight. Straps should be fitted in way of the joint on each side of the extended board and should be of steel having a length equal to the width of the board less any jointing profiles and width and thicknesses of 75mm and 0.07mm respectively. The butt straps should be screwed and not through bolted.

4.2.5.5 Care should be taken to ensure that the board type panels used as the insulating media for 'A' Class bulkheads are erected in accordance with the approved manufacturer's drawings and in particular that the correct thicknesses of boards and jointing profiles are used. The boards may be faced on their exposed and concealed surfaces with a combustible material of the prescribed thickness having low flame spread characteristics.

4.2.6 Electrical fittings on 'A' class linings

4.2.6.1 Lighting switches, power sockets and other electrical fittings and cables leading to such fittings should be surface mounted on the unconcealed side of linings which are the insulating media for 'A' Class bulkheads in order to ensure that the insulation standards of the bulkhead are not impaired. The cables may be uncovered or fitted in conduits or covered by omega profiles of steel or other materials having surfaces with low flame spread characteristics.

4.2.7 Ceilings which are components of 'A' Class decks

4.2.7.1 Ceilings which have been approved as components of 'A' Class decks should be constructed in accordance with the manufacturer's approved drawings. A ceiling should not be fitted closer to the deck plating than the dimension quoted in the certificate of approval. The panels from which a ceiling is constructed may be faced on their exposed and concealed surfaces with a combustible material of the prescribed thickness having low flame spread characteristics.

4.2.7.2 Hinged panels may be fitted in an 'A' Class ceiling in order to provide access for the control and maintenance of fire dampers located above the ceiling

provided that the integrity and insulation standard of the ceiling is not impaired, particularly when the ceiling incorporates an overlay of mineral wool insulation.

4.2.7.3 A ceiling which is a component of an 'A' Class deck should not be penetrated by bulkheads and linings which are 'B' Class or 'C' Class divisions or combustible divisions nor should it rely on support afforded by such bulkheads and linings. The ceiling should be supported in accordance with the approved manufacturer's drawings at the ships side, deckhouse side or 'A' Class bulkheads and also from the deckhead by steel hangers and/or on the flanges of the top profiles of bulkheads and linings, the profiles being supported by steel hangers from the deckhead. Figure 9 illustrates such arrangements.

4.2.8 Sprayed insulations

4.2.8.1 The density of a sprayed insulation in its dried out condition is required to be within the range of ±15% of the density specified by the manufacturer and indicated on the certificate of approval.

4.2.8.2 The thickness of a sprayed insulation indicated in the certificate of approval is a minimum thickness. Surveyors should use their discretion when checking the thickness of a sprayed insulation and may accept small areas in which the minimum thickness has not been achieved provided that the insulation in these areas are deficient by no more than 3mm and the thickness over the division is generally in excess of the minimum thickness.

4.2.9 'A' Class deck coverings

4.2.9.1 The preparation of the deck plating and the method of installing an approved 'A' Class deck covering are described in the certificate of approval and shown on the approved manufacturer's drawing.

4.2.9.2 Linings which are the insulating media for 'A' Class bulkheads and decks and linings which are 'B' Class or 'C' Class or are combustible should not penetrate an 'A' Class overdeck insulation. In each case the bottom profile should be fitted to the top of the 'A' Class insulation as shown on the appropriate manufacturer's approved drawing. Combustible surfaces fitted to an 'A' Class deck covering should not be laid under any bulkheads or linings. Figure 8 illustrates such arrangements.

4.2.10 Boundaries, intersections and terminal points of thermal barriers

4.2.10.1 It is essential that the fire integrity and insulation value of insulated 'A' Class divisions are maintained at the boundaries and terminal points of the division and where the division is intersected by other structural members. The method by which this may be achieved is by continuing the insulation along the boundaries and intersections for a distance of not less than 380mm in the case of steel structure and 450mm in the case of aluminum alloy structure. The thickness of the insulation used in the continuation ribands should be the same as that fitted over the plating of the division which is being insulated and not as that of the insulation fitted over the stiffeners or beams. This should apply to all structures at which the division terminates or which abuts or intersects the division such as bulkheads or decks, ships side or deckhouse side, webs or girders and beams or stiffeners. It may be necessary to fit ribands of insulation on the opposite side of the division to that on which the insulation is fitted. When a division is insulated by means of approved boards or panels, the continuation of the insulation may best be achieved by the use of an approved mineral wool insulation having a thickness corresponding to the same 'A' Class standard as that of the division which is being insulated. Figures 5, 6, 7, 14 and 15 illustrate typical arrangements to prevent heat transmission at boundaries, intersections and terminal points.

4.2.10.2 The continuous ribands may be omitted in the following locations:

(a) on the underside of a weather deck abutting a bulkhead which is being insulated; and

(b) on the upper side of a deck intersecting a bulkhead which is being insulated except when the bulkhead is a machinery casing.

4.2.11 Approved manufactured systems for pipes penetrating 'A' Class bulkheads and decks

4.2.11.1 Any approved manufactured system for pipe penetrations may be used for pipes penetrating 'A' Class divisions subject to compliance with the conditions specified in the certificate of approval and the details shown on the manufacturer's approved drawing.

4.2.11.2 Bends in pipes should be arranged sufficiently clear of a bulkhead or deck so as not to interfere with a pipe penetration. Pipe penetration systems are normally tested on straight pipes and consequently they should not be fitted round bends unless the certificate of approval indicates otherwise.

4.2.12 Acceptable non-manufactured systems for pipes penetrating 'A' Class bulkheads and decks

4.2.12.1 When the piping is of steel or any other material having a melting point of 1000°C or more either (a) or (b) should apply:

(a) The pipe should be welded directly to the bulkhead or deck or joined to a fitting of the same material which should be welded or bolted to the bulkhead or deck. Where practicable, in the case of an insulated bulkhead or deck the fitting should be of sufficient length to ensure that bolted flanges are clear of the insulation which is to be continued along the fitting for a distance of 380mm from the bulkhead or deck. When compression, push-in or similar joints are used, the length of the portion of the piping or fitting which is welded or bolted to the bulkhead or deck should not be less than 900mm with at least 400mm on the insulated side of the bulkhead or deck. Figure 26 illustrates such arrangements.

(b) When the pipe is not welded or bolted to the bulkhead or deck as indicated in (a) then each pipe should be passed through a steel circular conduit of 5mm minimum thickness which should be welded to the bulkhead or deck. A nominal 20mm gap should be provided between the pipe and the conduit which should be packed tightly throughout its length with an A-60 standard insulation approved by the Board of Steamship Inspection and sealed at each end with a suitable flexible sealant.

The minimum length of the spigots should be as follows:-

Outside Diameter	Minimum Length of Spigot
50mm or less	400mm
150mm or more	900mm

Lengths of conduits for intermediate diameters should be obtained by interpolation.

Compression, push-in or similar types of joints should not be positioned within the spigot and should not be less than 900mm apart.

The conduit should be positioned such that at least 400mm of its length is on the insulated side of the insulated bulkhead or deck as shown in Figure 27.

4.2.12.2 When piping is of a material having a melting point less than 1000°C the following should apply:

(a) Bulkheads

Each pipe should be passed individually through a 900mm long steel circular conduit of 5mm minimum thickness which should be welded to the bulkhead. A nominal 20mm gap should be provided between the pipe and the conduit which should be packed tightly throughout its length with an A-60 standard insulation approved by the Board of Steamship Inspection and sealed at each end with a suitable flexible sealant. There should be no joints in the pipe within the length of the conduit. The conduit should be positioned such that at least 400mm of its length is on the insulated side of the insulated bulkhead. Figure 28 illustrates such an arrangement.

(b) Decks

Pipes penetrating decks should be treated as indicated in (a) above except that when the piping extends vertically through more than one tweendeck, the vertical piping in alternate tweendecks should be of steel irrespective of whether or not the pipe is offset within its length.

4.2.13 Piping penetrating watertight 'A' Class bulkheads and decks

4.2.13.1 The piping should be of steel or any other material having a melting point of 1000°C or more and should be welded directly to the bulkhead or deck or joined to a bulkhead or deck fitting of the same material which should be welded or bolted to the bulkhead or deck as described in 4.2.12.

4.2.13.2 Compression, push-in or similar joints should not be used in piping systems which penetrate watertight 'A' Class bulkheads and decks.

4.2.13.3 Piping which is of any material having a melting point of less than 1000°C should not be used in piping systems which penetrate watertight 'A' Class bulkheads and decks.

4.2.14 Insulating pipe penetrations

4.2.14.1 When the piping penetrations referred to in 4.2.12 and 4.2.13 pass through insulated 'A' Class bulkheads and decks the insulation on the plating of the bulkhead or deck should be continued along the piping or spigot for a distance of not less than 380mm. Where a pipe has a bend close to the division the 380mm should be measured along the inside of the bend. The insulation should be secured effectively in place. See also 4.2.1.8 and 4.2.1.9.

4.2.14.2 When a pipe penetration passes through an 'A' Class bulkhead or deck that is insulated with a 'B' Class panel, the arrangement of insulation should be as illustrated in Figure 29.

4.2.15 Electric cables penetrating 'A' Class bulkheads and decks

4.2.15.1 Any approved manufactured cable transit may be used for electric cables penetrating non-watertight 'A' Class bulkheads and decks subject to compliance with the conditions described in the certificate of approval issued by the Board of Steamship Inspection and the details shown on the manufacturer's approved drawing. Figures 30 and 31 illustrate typical installation arrangements.

4.2.15.2 Alternatively the following procedures may be adopted:

The cables should be passed through steel conduits having a minimum length of 450mm and a minimum thickness of 5mm which should be welded to the bulkhead or deck. The internal cross sectional area of the conduits should not exceed 0.05m^2. A nominal distance of 20mm should be maintained between the cables and between the cables and conduit. The space between the cables and between the cables and the conduit should be packed tightly throughout the length of the spigot with an A-60 insulation approved by the Board of Steamship Inspection and the ends of the conduit sealed with a suitable flexible sealant. When the bulkhead or deck is insulated the conduit may project up to 400mm on the insulated side of the division but should not project more than 225mm on the uninsulated side of the bulkhead or deck. The insulation on the bulkhead or deck should be continued along the conduit and cables where applicable for a distance of not less than 380mm. Where the bulkhead or deck is uninsulated the conduit may project up to 400mm on either side. Figure 30 illustrates an acceptable arrangement.

4.2.15.3 Cables which penetrate watertight bulkheads and decks should only be passed through manufactured cable transits which have been approved by the Board of Steamship Inspection for this purpose as indicated in the certificate of approval.

4.2.16 Information required for approval

4.2.16.1 The following information is required to be submitted in order that the Board of Steamship Inspection may issue a certificate of approval for use of a material as the insulating medium for an 'A' Class bulkhead or deck:

(a) a copy of the test report issued by the testing laboratory for each fire test carried out in accordance with the applicable test

procedure described in TP439, "Structural Fire Protection Standards: Testing and Approval Procedures";

(b) a sample of the material measuring approximately 100mm x 100mm for examination and record;

(c) any trade literature which the manufacturer may have on the material; and

(d) two copies of a drawing showing the following information:

(i) in the case of a mineral wool or ceramic fibre insulation, the drawing should show details of the insulation including its name, reference number and/or letters, thickness and density; an elevation of a part typical bulkhead or upwards view of a part typical deck showing the disposition of the pins; sections through a bulkhead in way of large and small stiffeners or a deck in way of large and small beams; a large scale detail of a welded steel pin or welded aluminum alloy boss and screwed stainless steel pin, the galvanized steel expanded metal and a spring steel washer. In the case of an A-60 standard insulation the drawing should incorporate a section showing the staggering of joints in the two layers of insulation;

(ii) in the case of a board or panel type of bulkhead insulation the drawing should show details of the board or panel including its name, reference number and/or letters, its dimensions and density and in the case of a composite panel details of its components; air gaps between the board or panel and the bulkhead plating and between the board or panel and the stiffeners; connections to the deck and deckhead and shipside or deckhouse side; butt joints and joints for inside and outside corners;

(iii) in the case of panels used in the construction of a ceiling which is the insulating medium for an 'A' Class deck the drawing should show details of a panel including its name, reference number and/or letters, its dimensions and density and, in the case of a composite panel, its components; the hangers and framework supporting the ceiling panels and dimensions of each profile used in their construction; connections to the ship's side or deckhouse side and to 'A','B','C' and

combustible bulkheads; the joint across a ceiling which exceeds the maximum length of the panels; and the arrangement in way of the boundary of an 'A' Class deck which is clear of any 'A' Class bulkhead or the ship's side or deckhouse side;

(iv) in the case of a sprayed insulation the drawing should show details of any necessary preparatory work to be carried out on the structure of the bulkhead or deck and the coverage rate in square metres/litre and corresponding dry film thickness of each coating which is to be applied to the structure before the insulation is sprayed; the mechanical retention; and the name reference numbers and/or letters, thickness and density of the insulation. The drawing should also indicate the number of bags of dry mix of the insulation ingredients which when mixed with water will cover one square metre of a bulkhead or deck at the correct thickness and density;

(v) in the case of a deck covering for use as an insulating medium for an 'A' Class deck the drawing should show a full sized section through the deck covering, detailed sections through the deck covering in way of the ship's side, a steel bulkhead and a 'B','C' or combustible bulkhead, a plan view of the deck covering showing the various layers of the constituent materials cut away in turn and sections through the deck covering in way of penetrations such as pipes and ventilation ducts.

4.3 'A' Class Doors and Shutters

4.3.1 General

4.3.1.1 Doors and shutters

(a) Every door and shutter assembly which is used to close openings in 'A' Class bulkheads should be of an approved type and its construction and method of installation should be in accordance with the conditions specified in the certificate of approval issued by the Board of Steamship Inspection and the details shown on the manufacturer's approved drawing.

(b) When a door or shutter is used to close an opening in an 'A' Class bulkhead constructed of aluminum alloy it should be fitted in a stiffened steel panel attached to the aluminum

bulkhead by 12mm diameter steel bolts spaced 300mm apart. The steel plate should extend 450mm beyond the sides and top of the frame of the door or shutter. The steel plate and bolts should be suitably isolated from the aluminum alloy to the satisfaction of the attending surveyor.

(c) In no case should a primary or a surface deck covering be fitted under an 'A' Class door or shutter. The sill plate, sill channel or coaming, whichever is applicable should be welded to the deck plating and such coverings stopped on each side of it.

(d) Grilles and louvres should not be fitted in 'A' Class doors or shutters. If a hose port is fitted it should be self-closing and constructed of material which is equivalent in fire resistance to that of the door in which it is fitted. The hose port should be 150mm square and should be inset into the lower edge of the door leaf, opposite the door hinges, or in the case of a sliding door, nearest the opening.

4.3.1.2 Doors only

(a) A door should have the same or higher 'A' Class standard as the bulkhead in which it is fitted.

(b) A window having a clear glass area not exceeding 0.02 m² may be fitted in the upper half of an 'A' Class door provided that:

(i) it is positioned no closer than 150mm to any edge of the door leaf;

(ii) the window is of toughened safety glass and the window frame and glazing bar are of steel;

(iii) the door incorporating the window has been successfully fire tested and a certificate of approval issued and details of the window are shown on the manufacturer's approved drawing.In no case should a window be accepted in an 'A' Class door which does not comply with these conditions.

4.3.1.3 Shutters only

(a) In no case should a shutter be fitted in an 'A' Class bulkhead other than a bulkhead of A-0 standard.

(b) A drop-rolling shutter should be capable of automatic closure after initial release.

4.3.2 Doors in spaces of high humidity

4.3.2.1 'A' Class doors which are fitted in the boundary bulkheads of boiler rooms, refrigerated machinery spaces and similar spaces having atmospheres of high humidity may be constructed of stainless steel instead of mild steel without the necessity to retest the doors provided that all other materials and details of construction are the same as shown on the manufacturer's approved drawing.

4.3.3 Installation

4.3.3.1 Each door or shutter should be inspected by the attending surveyor to verify as far as it can be determined that the door or shutter and its frame have been constructed in accordance with the drawing referred to on the identification plate and that the 'A' Class standard of the door or shutter is at least the same as that of the bulkhead in which it is fitted.

4.3.3.2 The attending surveyor should satisfy himself that the bulkhead has been faired and adequately stiffened around any opening in which a door or shutter is to be fitted in order to ensure that no stresses will be imposed on the door or shutter and its frame which may cause them to distort and become inoperable. It is not intended that the frame of a door or shutter should form any part of such stiffening.

4.3.3.3 Each door or shutter should be examined after it has been fitted to verify that:

(a) the door or shutter and its frame have been properly fitted in the bulkhead;

(b) the clearances between the edges of the door or shutter and its frame correspond reasonably with those shown on the manufacturer's approved drawing; and

(c) the latches or shootbolts of a door or shutter are properly engaging the frame. The dimensions of the holes in a doorframe in which the top and bottom latches or shootbolts engage should be approximately 5mm greater than the dimensions of the latches or shootbolts in order to cater for minor movements of the door and its frame during service.

4.3.3.4 Opening and closing tests should be carried out on each door or shutter after the closing devices have been positioned so that the attending surveyor may

be satisfied as far as is practicable that the door or shutter complies with the appropriate regulations. These tests should be carried out whilst the ship is in the upright position.

4.3.3.5 Sliding fire doors should have positive means of closing under all conditions. It has become common practice to fit power assist systems to such doors to make their operation easier for passengers, however, the fitting of such systems is not to result in the removal of counterweights which are required to ensure fail-safe operation of the doors.

4.4 'B' Class Bulkheads, Linings and Ceilings

4.4.1 Construction

4.4.1.2 Generally, 'B' Class bulkheads linings and ceilings are constructed of individual panels joined together by a system of steel framing. 'B' Class bulkheads are required by the regulations to extend from deck to deck and to the shell or other boundaries unless continuous 'B' Class ceilings and linings are fitted on both sides of the bulkhead, in which case they may terminate at the ceiling or lining. Figures 16, 17 and 18 illustrate acceptable arrangements. In passenger ships where continuous 'B' Class ceilings or linings are fitted on both sides of the corridor bulkheads, the portion of the bulkhead behind the ceiling or lining should be of a material which in thickness and composition is acceptable in the construction of 'B' Class bulkheads but meets 'B' Class integrity standards only insofar as is practical. Figure 23 shows acceptable methods of compliance with this requirement.

4.4.1.3 'B' Class bulkheads, ceilings and linings are required by the regulations to be constructed of approved non-combustible materials which have been tested and approved by the Board of Steamship Inspection in accordance with the procedures described in TP 439, 'Structural Fire Protection Standards: Testing and Approval Procedures'. The methods of erecting 'B' Class bulkheads, ceilings and linings should be in accordance with the conditions described in the certificate of approval and the details shown on the approved manufacturer's drawing

4.4.1.4 When a 'B' Class bulkhead or lining is required to be fitted deck to deck in a tween deck the height of which exceeds the maximum length of the panel from which the bulkhead or ceiling is constructed, the panels may be increased by butt strapping extension panels of the same material to them, the joint between the panels being tight. Straps should be fitted in way of the joint on each side of an extended panel and should be of steel having a length equal to the width of the panel less any jointing profiles and a width

and thickness of 75mm and 0.7mm respectively. The butt straps should be screwed and not through bolted. The jointing profiles should be fitted deck to deck.

4.4.1.5 When a 'B' Class bulkhead or lining is fitted deck to deck, closing arrangements shall be fitted in way of structural members as shown in Figure 24.

4.4.2 Steel or aluminum alloy 'B' Class bulkheads

4.4.2.1 Subject to any additional requirements for load bearing structure, the minimum scantlings required for steel or aluminum alloy 'B' Class bulkheads should be the same as those for steel and aluminum alloy 'A' Class bulkheads as derived from the table and notes in paragraphs 4.2.1.3 to 4.2.1.7.

4.4.2.2 The regulations require that the insulation of aluminum alloy 'B' Class bulkheads should be such that the temperature of the aluminum alloy core does not rise more than 200°C above the ambient temperature at any time during a standard fire test of 30 minutes duration. This requirement applies to 'B' Class bulkheads of both B-15 and B-0 standard.

4.4.2.3 Steel 'B' Class bulkheads of B-15 standard should be insulated to the same standard as steel 'A' Class bulkheads of A-15 standard and aluminum alloy 'B' Class bulkheads of B-15 and B-0 standards should be insulated respectively to the same standards as aluminum alloy 'A' Class bulkheads of A-15 and A-0 standards unless a certificate of approval has been issued by the Board of Steamship Inspection for the appropriate 'B' Class standard.

4.4.3 Termination of 'B' Class bulkheads, ceilings and linings

4.4.3.1 A 'B' Class bulkhead, ceiling or lining should not terminate at another 'B' Class bulkhead, ceiling or lining of lower standard, or a 'C' Class or combustible bulkhead, ceiling or lining.

4.4.4 Marking

4.4.4.1 Each panel used in the construction of a 'B' Class bulkhead, ceiling or lining should bear the identification marking as indicated on the appropriate certificate of approval.

4.4.5 Bottom profiles

4.4.5.1 The steel angle or channel profiles which support the bottom edges of the panels from which a "B' Class bulkhead or lining is constructed, should be welded to the deck plating or connected to the expanded metal or equivalent fitted over an 'A' Class deck covering by welding or steel fastenings as shown on the approved manufacturer's drawing for the 'A' Class deck covering. In no case should a 'B' Class bulkhead or lining penetrate an 'A' Class insulation incorporated in an approved deck covering. Primary or surface deck coverings which are combustible should not be laid under 'B' Class bulkheads or linings. Figures 8, 19 and 20 illustrate such arrangements.

4.4.6 Top profiles

4.4.6.1 The top edges of the panels from which a 'B' Class bulkhead or lining is constructed should be housed in steel channel profiles with a gap between the top edges of the panels and the inside of the webs of the channels in order to prevent the panels being effected by any movement in the ship's structure. The channel profiles supporting the top edges of the panels should be welded to either:

(a) the deckhead;

(b) the bottom edge of the beams, the gaps between the beams being plated-in or filled-in using the same panels from which the bulkhead or lining is constructed;

(c) the bottom edge of a continuous steel curtain plate having a minimum thickness of 3mm. when the depth of curtain a plate exceeds 450mm its lower edge should be flanged and it should be stiffened to the satisfaction of the attending surveyor. When the bulkhead or lining is of B-15 standard the curtain plate should be insulated on one side with an 'A' Class mineral wool insulation of A-15 standard attached to the curtain plate by means of welded steel pins, expanded metal and spring steel washers; or

(d) steel hangers welded to the deckhead and having scantlings and a spacing as shown on the approved manufacturer's drawing from which the bulkhead or lining is constructed. When the distance between the top channel profile and the deckhead is in excess of 500mm, the attending surveyor should consider whether or not it is necessary to increase the scantlings of the steel hangers in order to maintain the stability of the bulkhead or lining particularly in a direction at right angles to the division.

The hangers may be omitted in the case of a lining which terminates at a continuous 'B' Class ceiling provided that the top channel profile of the lining is welded to the stringer which connects the ceiling to the ship's side or deckhouse side and 'A' Class bulkheads respectively as shown on the approved manufacturer's drawing for the ceiling panels.

4.4.6.2 In no case should the top channel profile be laid directly on top of the panels from which a 'B' Class bulkhead or lining is constructed i.e. without an air gap.

4.4.6.3 When a shipbuilder wishes to construct a 'B' Class bulkhead or lining by erecting the panels before the steel hangers and channel profile, the gap between the top edge of the panel and the inside of the profile should be maintained by bonding strips of an 'A' Class mineral wool insulation to the top edge of the panels at approximately 600mm spacing before fitting the top channel profile. The strips of insulation should be bonded in place with their fibres positioned vertically and their length should be 100mm, their width equal that of the panels and their depth equal to the gap above the top edge of the panels as indicated on the approved manufacturer's drawing.

4.4.6.4 The top channel profiles of 'B' Class bulkheads should be unperforated when they support ceilings which are the insulating media for 'A' Class decks of A-60 standard except for holes which are permitted for the passage of electric cables as indicated in paragraph 4.4.11.

4.4.6.5 Figures 19 and 20 illustrate acceptable arrangements.

4.4.7 Access panels

4.4.7.1 Hinged panels may be fitted in a 'B' Class ceiling or lining in order to provide access for the control and maintenance of fire dampers in ventilation ducting positioned behind the ceiling or lining provided that the integrity and insulation standards of the ceiling or lining are not impaired particularly in the case of a ceiling overlaid with a mineral wool insulation. Each access panel should be provided with a bolt or catch to keep it in the closed position except that bayonet catches should not be used.

4.4.8 Lighting and ventilation fittings

4.4.8.1 Lighting fittings should preferably be surface mounted on a 'B' Class ceiling but when a fitting penetrates the ceiling it should be of steel or covered with a steel box and fastened effectively to the ceiling in order to maintain the integrity of the ceiling. When the ceiling is of B-15 standard the steel light fitting should be covered by a mineral wool insulation which has been

approved by the Board of Steamship Inspection for an A-15 standard, the insulation being effectively secured to the fitting or cover. Alternatively the light fitting may be boxed in using a 'B' Class material having a thickness appropriate to a B-15 standard. Ventilation fittings are to be protected in a similar manner.

4.4.8.2 Figures 43 and 44 illustrate acceptable arrangements.

4.4.9 Cables inside panels or jointing profiles

4.4.9.1 Cables should not be fitted in ducts arranged in panels from which 'B' Class bulkheads or linings are constructed or in the jointing profiles unless the approved manufacturer's drawing for a particular panel shows otherwise. An approved drawing will only indicate that cables may be so installed when a bulkhead incorporating cables and switches has been successfully fire tested. Only cables from switches and or power outlets located on the same side of a bulkhead or lining should be led through a duct or profile.

4.4.10 Pipes penetrating 'B' Class bulkheads, ceilings and linings

4.4.10.1 When pipes of steel or any other material having a melting point of 1000°C or more pass through 'B' Class bulkheads, ceilings or linings, they should be fitted with collars made from the same material as that of the division. The collars should be fitted on one side of the bulkhead only and adequately screwed to the division. The collars should be a tight fit around the pipes in order to maintain the integrity of the division. When compression, push-in or similar joints are used, the length of the portion of the pipe which is to be collared to the bulkhead should not be less than 900mm in order to ensure that the integrity of the division is not impaired if there is movement in the pipe and a joint separates adjacent to the division. Figures 35 and 36 illustrate these and other acceptable arrangements.

4.4.10.2 When pipes of any material having a melting point of less than 1000°C pass through 'B' Class bulkheads, linings or ceilings, they should be fitted individually in a steel circular conduit having a minimum thickness of 1.5mm. Each conduit should be a close fit in the hole in the bulkhead, ceiling or lining and should have a welded steel collar which is to be screwed to the bulkhead, ceiling or lining. A nominal 20mm gap should be provided between the pipe and the conduit which should be packed tightly through its length with an A-60 standard insulation approved by the Board of Steamship Inspection and sealed at each end with a suitable flexible sealant.

The minimum length of the conduits should be as follows:-

Outside Diameter	Minimum Length of Conduit
50mm or less	450mm
150mm or more	900mm

Lengths of conduits for intermediate diameters of pipe should be obtained by interpolation.

When a conduit is fitted in a 'B' Class bulkhead, ceiling or lining of B-15 standard it should be positioned that at least 400mm of its length is on one side of the bulkhead, ceiling or lining. Compression, push-in or similar type joints should not be positioned within the conduit and should not be less than 900mm apart. Figures 37 and 38 illustrate these and other acceptable arrangements.

4.4.10.3 When a pipe penetrates a 'B' Class bulkhead, ceiling or lining of B-15 standard, the pipe or spigot should be insulated for a distance of 380mm from the bulkhead, ceiling or lining with an A-15 standard insulation approved by the Board of Steamship Inspection. Where a pipe has a bend close to the division the 380mm should be measured along the inside of the bend.

4.4.11 Cables penetrating 'B' Class bulkheads, ceilings and linings

4.4.11.1 Cables in conduits

Where up to three in number cables for lighting and power in cabins and similar spaces penetrate 'B' Class bulkheads, ceilings and linings they may be fitted in a steel conduit having a minimum length of 450mm and of such an internal diameter as to provide a close fit round the cables. The conduit should be passed through a hole in the bulkhead, ceiling or lining having the same diameter as the outside diameter of the conduit. The ends of the conduit should be sealed with a suitable flexible sealant except that the sealant need not be applied to the end of a conduit which is inside a switch or outlet.

4.4.11.2 Cables in transits

Where cables other than those referred to in paragraph 4.4.11.1 penetrate a 'B' Class bulkhead, ceiling or lining they should be passed through transits having a minimum length of 300mm and constructed of steel of 1.5mm thickness. The internal cross sectional area of the transits should not exceed 0.05 square metre. The transits should be a close fit in the holes in the

bulkhead, ceiling or lining and should be attached to the bulkhead, ceiling or lining by screwed steel angle or plate collars such that the integrity of the bulkhead, ceiling or lining is not impaired. A nominal distance of 20mm should be maintained between the cables and the cables and the transit and the transit should be packed tightly throughout its length with an A-60 standard insulation approved by the Board of Steamship Inspection and the ends of the transit sealed with a suitable flexible sealant.

4.4.11.3 Conduits and transits which are fitted in 'B' Class bulkheads, ceilings or linings of B-15 standard should be insulated for a distance of 380mm from the division with an A-15 standard insulation approved by the Board of Steamship Inspection. The insulation should be effectively secured.

4.4.11.4 Figures 39 and 40 illustrate the above arrangements.

4.4.11.5 Cables on or in bulkheads or linings

Cables leading to switches and/or outlets should be surface mounted on 'B' Class bulkheads or linings and they may be exposed, fitted in a conduit, or covered. The cables may also be fitted in a duct within the panels from which the bulkhead or lining is constructed or in the joining profiles subject to compliance with paragraph 4.4.9.

4.4.12 Drawings

4.4.12.1 Each type of 'B' Class bulkhead system is approved on the basis of testing together with the approval of detailed drawings showing the installation on board the ship. These drawings should reflect the following:

(a) vertical sections covering all pertinent installation details and clearly depicting:

(i) deck and deckhead connections to the ship's structure;

(ii) ceilings and lining connections;

(iii) draft stop connections;

(iv) dimensions and thicknesses of all retaining shapes, etc.; and

(v) the type, size and spacing of all bolts and/or screws used in the assembly of the panels or draft stops.

(b) Horizontal sections covering all pertinent installation details and clearly depicting all joints and connections.

(c) Details of joint posts; corner posts and other retaining shapes which should be at least 1.5mm thick steel except that these shapes may be of 0.75mm steel sheets, double thickness, with at least a 19mm lap into the panel unless having been tested otherwise.

4.4.12.2 Drawings for 'B' Class ceilings should reflect similar details of construction and installation as required for 'B' Class bulkheads.

4.5 Draft Stops

4.5.1 Where 'B' Class bulkheads terminate at ceilings and linings, this results in void spaces being created above ceilings and between the linings and the shell or deckhouse side. These void spaces must be fitted with both longitudinal and transverse draft stops every 14m to limit the maximum area within the void space as shown on Figure 21.

4.5.2 Draft stops are required by the regulations to be constructed of non-combustible materials.

4.5.3 Any of the following methods of construction may be used to construct draft stops:

(a) the extension of 'B' Class bulkheads, ceilings or linings the details of which are shown on the appropriate approved drawing;

(b) the extension of 'C' Class bulkheads, ceilings or linings;

(c) 1mm thick minimum steel sheet, intermittently welded to the structure, stiffened where necessary and attached to the top profiles of bulkheads or fitted tightly to ceilings or linings. Any lightening holes in the ship's structure which is used as part of a draft stop should be plated over;

(d) approved non-combustible board type materials supported by steel flat bars or steel angle or channel profiles attached to the ship's structure, bulkheads, ceilings or linings and fitted tightly to such structures or divisions;

(e) approved 'A' Class mineral wool insulation, not less than 25mm in thickness, faced on each side with galvanized steel expanded metal mesh, 18 gauge x 38mm, the sheets of mesh

being tied together through the insulation by galvanized wire at not more than 450mm spacing. The mesh on one side of the insulation should be attached to the ship's structure and to the 'B' Class bulkheads or ceilings.

(f) Figure 22 illustrates acceptable arrangements.

4.6 'B' Class Doors

4.6.1 General

4.6.1.1 Every door assembly which is used to close openings in 'B' Class bulkheads should be of an approved type and its construction and method of installation should be in accordance with the conditions specified in the certificate of approval and the details shown on the manufacturer's approved drawing.

4.6.2 Attachment to bulkheads

4.6.2.1 A doorframe of a 'B' Class door assembly should not be screwed or bolted to 'B' Class bulkheads constructed of board type materials because the expansion of the steel frame could cause serious cracking in boards during a fire situation which could result in an integrity failure of the bulkhead.

4.6.3 Ventilation openings

4.6.3.1 The 0.05m^2 total net area limitation for openings in and/or under 'B' Class doors is applicable to single and double leaf doors. In the case of a double leaf door the limitation should apply to the whole door and not to each leaf individually.

4.6.3.2 When a door is fitted with an escape panel the ventilation opening should be incorporated into it.

4.6.3.3 In addition to a ventilation grille being capable of manual closure from each side of the door it may be closed by means of a spring actuated by the melting of a fusible link or similar. In no case should the automatic means of closing be accepted without the manual means of closure.

4.6.4 Escape panels

4.6.4.1 Escape panels should be constructed in accordance with the details shown on the manufacturer's approved drawing and the panels should not exceed 410mm x 410mm in size. Where no details of an escape panel are shown on

the manufacturer's drawing, the door manufacturer should be requested to submit details of the construction to Ship Safety Headquarters (AMSDD) for consideration before use.

4.6.5 Locks

4.6.5.1 Every 'B' Class door fitted in a cabin bulkhead should be capable, when locked, of being opened manually from the cabin side other than by means of the key or key card.

4.6.5.2 Any 'B' Class door, other than a cabin door, which is fitted to an opening forming part of an escape route should not be capable of being locked shut except that when such a door is required to be locked shut by the owner for any justifiable reason, keys should be provided on each side of the door in glass fronted boxes fitted close to the door.

4.7 Construction of 'C' Class Bulkheads, Linings and Ceilings

4.7.1 Construction

4.7.1.1 Although the Board of Steamship Inspection does not issue certificates of approval for 'C' Class bulkheads, linings and ceilings, they should be constructed of approved non-combustible materials. Profiles used in the construction of 'C' Class bulkheads, linings and ceilings should be of steel or aluminum alloy.

4.7.1.2 Any 'C' Class bulkheads constructed of aluminum alloy which are structural bulkheads supporting 'A' Class decks are required to be insulated such that the temperature of their structural core does not rise more than 200°C above the ambient temperature when subjected to a standard fire test for the same periods of time as required for the deck which they are supporting.

4.7.1.3 The use of glass in 'C' Class bulkheads or partitions should be kept to a minimum because of the hazards which could be created if such bulkheads or partitions were to collapse or shatter during a fire or other emergency situation.

4.7.2 'A' Class overdeck insulations

4.7.2.1 A 'C' Class bulkhead or lining should not penetrate an 'A' Class overdeck insulation incorporated in an approved deck covering. The bottom profile of the bulkhead or lining should be attached to the expanded metal fitted over the insulation by means of welding or steel fastenings whichever is applicable as shown on the manufacturer's approved drawing for the 'A' Class deck covering. Figure 8 illustrates acceptable arrangements.

4.7.3 Deck coverings

4.7.3.1 Primary or surface deck coverings which are combustible should not be laid under 'C' Class bulkheads or linings.

4.8 Aluminum Alloy Structures

4.8.1 The methods of insulating aluminum alloy structures are quite different from those of steel for several basic reasons. When considering either steel or aluminum alloy, 60 minutes is the longest period of time any assembly is required to maintain its integrity under fire conditions. By examining the standard time-temperature curve, we find that after 60 minutes the furnace temperature is approximately 900°C. For steel bulkheads and decks, this temperature is below the melting point of the steel, thus if a fire should occur on either side of a steel division, structural integrity will be maintained. Structural fire insulation, may be installed on either side of a steel division in accordance with the conditions described on the certificate of approval. For aluminum alloy, however, a different situation exists. To maintain its structural integrity under fire conditions for more than several minutes, the aluminum alloy must be insulated to keep the aluminum alloy core temperature below 200°C. Although the melting point is much higher, failure of aluminum alloy under loaded conditions may occur at this temperature.

4.8.2 Since it cannot be predetermined from which side fire exposure will occur, insulation must be applied to the aluminum alloy so that it will be sufficiently protected to withstand one hour fire exposure from either side, except in cases where exposure from only one side is possible.

4.8.3 A steel plate (minimum thickness of 5mm) without insulation is rated as Class A-0; however, an aluminum plate (minimum thickness of 7mm) must have an insulation value (Fc) of .72 S to be rated as Class A-0. The Class A-0 steel plate can be changed to Class A-15, A-30 or A-60 by adding some predetermined thickness of approved structural insulation, but the aluminum Class A-0 assembly, which already included some amount of structural insulation, cannot be changed to Class A-15, A-30 or A-60 by the same process.

Depending upon the configuration of the insulation and the aluminum alloy plate, the insulating value of the assembly may increase or decrease. As a result, bulkhead and deck assemblies can be constructed which will have different fire endurance capability, depending upon which side of the assembly is exposed to fire. TP439, "Structural Fire Protection Standards: Testing and Approval Procedures" describes a variety of bulkhead and deck assemblies, showing the total insulating value of the assembly (Ft), and the core insulating value (Fc) provided by the insulation on each side of the

aluminum plate. Simply stated, the (Fc) value determines whether the assembly is 'A', 'B' or 'C' Class and the (Ft) value determines whether the assembly can be rated Class A-0, A-15, A-30 or A-60.

4.8.4 When planning aluminum construction, formidable amounts of insulation may be required to comply with the current regulations for structural fire protection. For example, consider that a common bulkhead separating two spaces is required to be Class A-60. If a fire risk exists on either side of the bulkhead, Class A-60 capability must be provided on both sides of the bulkhead.

4.9 Hinged or Portable Decks

Hinged or portable decks used for the carriage of vehicles should be constructed of steel. Ramps connecting any decks which are used for the carriage of vehicles should also be constructed of steel.

4.10 False Decks

False decks should be constructed of steel or other equivalent material except that small areas in lounges and dining rooms used as dance floors may be constructed of wood which should be included in the total volume of combustible facings, mouldings etc. referred to in the regulations. A false deck is any deck which is fitted above the level of a structural deck for any purpose and is sometimes referred to as a false or raised floor. See also paragraph 12.5.9.

4.11 Separation of Machinery Spaces from Other Spaces

Any insulated bulkhead or deck which separates any machinery space from any other space should not be substituted by a cofferdam formed by uninsulated bulkheads or decks even though the arrangement would theoretically satisfy the regulations by treating the cofferdam as an intervening void space. A cofferdam does not provide the same degree of protection as an insulated division. This should also apply to any arrangement involving a false deck (see paragraph 4.12).

4.12 Means of Escape

4.12.1 General

4.12.1.1 The basic purpose of structural fire protection is to provide a life safety system for the passengers and crew. The configuration of passageways, stairways and doors is highly important to this system. Two means of escape are necessary from all living and working areas. If one of the escape routes requires using a watertight door, it is possible that this escape route could be blocked in order to maintain the watertight integrity of the vessel. Therefore, at least one escape route from all areas should be independent of watertight doors. Additionally, the means of escape should be as far apart as possible. This concept is intended to prevent any one incident from blocking both escape routes.

4.12.2 Special category spaces

4.12.2.1 The stairways forming the means of escape from each special category space should be suitably spaced in order to provide adequate coverage to the whole of the space. One stairway should be provided for every 40m of length and at least one stairway should be provided at each end of the space and one stairway at approximately mid-length, each of which provides continuous fire shelter in the form of a stairtower to the survival equipment embarkation deck.

4.12.2.2 In ships fitted with two or more casings, the spacing of stairways providing continuous fire shelter should apply to each casing.

4.12.3 Ro-ro cargo spaces

4.12.3.1 Ro-ro cargo spaces should be fitted with two means of escape one of which shall provide continuous fire shelter in the form of a stairtower to the survival equipment embarkation deck. The two means of escape should be situated at opposite ends of the space. Additional means of escape may be necessary in a space which extends over a considerable portion of the ship's length.

4.12.4 Machinery spaces

4.12.4.1 The continuous fire shelter which is required by the regulations to be provided for one of the two means of escape from each machinery space should be regarded as a stairtower for the purpose of determining the 'A' Class standards to which it should be insulated in way of adjacent spaces.

4.12.4.2 The shelter should extend from the floor plate level to a level at which there is direct access into a space other than a special category space, which provides a safe escape route to the survival equipment embarkation deck.

4.12.4.3 The shelter should be of sufficient cross sectional dimensions to provide unrestricted access within its height and should not be used for pipes, cables ducts etc. except for cables serving light fittings within the shelter. The cross sectional dimensions of the shelter should be increased in way of each opening in order to provide a landing within the shelter and permit the door to open without affecting a person who may be climbing the ladder.

4.12.4.4 An opening into the shelter should be provided at floor plate level and at each flat or grating level within the height of the shelter except that such an opening need not be provided at any flat or grating level at which there is a door in a boundary of the machinery space which provides a safe escape route to the survival equipment embarkation deck.

4.12.4.5 Each opening in the shelter should be fitted with a self-closing 'A' Class door of the same 'A' Class standard as the part of the shelter in which it is fitted.

4.12.4.6 A control room situated within a machinery space should be provided with means of escape which does not entail entering the machinery space. This may be achieved by one of the following:

(a) direct access into the continuous fire shelter; or

(b) direct access into an adjacent space which provides a safe escape route to the survival equipment embarkation deck.

4.12.5 Stairways

4.12.5.1 Stairways and stairtowers form the primary means of escape within the vessel. As such, it is vital that these enclosures be designed to provide a means of escape during a fire and also to prevent the spread of fire between decks.

4.12.5.2 There are two basic arrangements specified by the regulations. The first involves a stairway which only penetrates a single deck as shown in Figure 25. Because this is a penetration of one deck, it is only necessary to provide a door and enclosure bulkheads at one level. In this case, the stairway enclosure should be protected in accordance with fire rating tables for decks contained in the applicable regulations.

4.12.5.3 The second design involves a stairway which penetrates more than one deck as shown in Figure 25. This type of stairway is considered a stairtower. A stairtower is a continuous vertical trunk constructed to at least Class A-0 standard. In cargo ships and tankers where there are at least two means of escape providing direct access to the open deck at every level, the stairtower may be of Class B-0 construction.

4.12.5.4 The two designs described above are the only arrangements contemplated by the regulations. Other designs which place several stairways, each of which penetrates only a single deck, vertically above or adjacent to each other, are not considered equivalent to a stairtower and are not permitted by the regulations.

4.12.5.5 Where a stairtower has no direct access to the survival equipment embarkation deck, the corridors between the stairway and the embarkation deck should be assumed to be part of the stairtower with its boundaries having the appropriate 'A' Class standards accordingly.

4.12.5.6 Detailed requirements with respect to stairways and sloping ladders on passenger ships are described in TP2237, "Equivalent Standards for Fire Protection of Passenger Ships". At present there are no regulatory requirements with respect to stairways and sloping ladders on cargo ships and tankers. However, on such vessels the stairways and sloping ladders should generally comply with the requirements for crew members described in TP2237.

4.12.5.7 In no case should any escape route providing access for passengers to the survival equipment embarkation deck incorporate a vertical or near vertical ladder.

4.12.6 Protection of stairways

4.12.6.1 The treads, risers and backing plates, when fitted, of stairways should be constructed of steel except that they may be constructed of aluminum alloy when the structure is of aluminum alloy. Stairway enclosures constructed of steel which are required to be insulated, may be insulated on either side but when the enclosures are insulated on the inside measures should be taken to prevent heat transmission through the boundaries in way of decks, landings etc. Stairway enclosures constructed of aluminum alloy should be insulated at least on their outside to the appropriate 'A' Class standard specified in the regulations.

4.12.6.2 Escalators should be considered in all respects as stairways. Adequate area should be provided in the enclosures at each end of an escalator in order to avoid congestion and the doors in the enclosure bulkheads should be of adequate width to permit passengers to disperse quickly. Due regard should be paid to the design and position of controls so as to prevent unauthorized use. However emergency stop controls should be provided in readily accessible positions.

4.12.7 Elevator trunks in stairway enclosures

4.12.7.1 The boundaries and doors of an elevator trunk which is situated entirely within a stairway enclosure are not required to meet any 'A' Class standard provided that:

(a) any boundary of the elevator trunk which forms part of the stairway enclosure is an 'A' Class division of the appropriate standard as specified in the regulations; and

(b) any opening in the elevator trunk which gives direct access to any space situated outside the stairway enclosure is provided with an approved door of the same 'A' Class standard as the bulkhead as in which it is fitted.

4.13 Ventilation Systems (Passenger ships)

4.13.1 General

4.13.1.1 The ventilation systems serving the following spaces should be independent of accommodation spaces, service spaces and control stations and should be independent of each other:

(a) stairway enclosures;

(b) a galley;

(c) a machinery space;

(d) a special category space;

(e) a cargo space; and

(f) a ro-ro cargo space.

4.13.1.2 Wherever practicable, the duct system from each ventilation fan should remain within one main vertical or horizontal zone. Where of necessity, a ventilation duct passes through a main vertical or horizontal zone division, a fail safe automatic closing fire damper capable of being manually closed from each side of the division, should to be fitted adjacent to the division regardless of duct size.

4.13.2 Duct material

4.13.2.1 Ducts not less than 0.075 square metre in sectional area and all vertical ducts of any cross sectional area serving more than a single between-deck space are required to be of steel or other equivalent material. Where an equivalent material such as aluminum alloy is used the inside and the outside of the duct would need to be insulated to A-0 standard.

4.13.2.2 Ducts less than 0.075 square metre in cross sectional area are required to be of non-combustible materials.

4.13.2.3 Short ducts, not exceeding 2 metres in length and with a cross sectional area not exceeding 0.02 square metre may be constructed of combustible material, subject to the following conditions:

(a) the material should have low flame spread characteristics;

(b) they may only be used at the end of a ventilation device;

(c) they should not be situated less than 600mm along the duct, from an opening in an 'A' or 'B' Class ceiling.

4.13.2.4 Vertical ducts which pass through more than one deck require to be insulated in accordance with the appropriate table in Schedule 'B' of TP2237, 'Equivalent Standards for Fire Protection of Passenger Ships'. Where the decks have differing 'A' Class standards the duct shall be insulated to the higher standard. Compliance with this requirement may be achieved in the case of vertical ducts which are fitted with fire dampers by insulating each fire damper to the extent shown in Figures 32 and 33.

4.13.3 Duct penetrations

4.13.3.1 Where ventilation ducts pass through 'A' Class bulkheads or decks, the openings are required to be fitted with steel spigots unless the ducts passing through the bulkhead or deck are of steel of an equivalent thickness. The spigot shall have a thickness of at least 3mm and a length of at least 900mm. When passing through bulkheads, this length shall be divided preferably into 450mm on each side of the bulkhead. These spigots shall be insulated to the same fire integrity and insulation value as the deck or bulkhead through which the duct passes. Figure 32 and 33 illustrate this arrangement.

4.13.3.2 Where ventilation ducts pass through 'B' Class bulkheads, ceilings and linings, the ducts are to be fitted with collars, steel spigots or sleeves. Steel ducts and double skinned spiroducts, not exceeding 0.075 square metre in cross sectional area should be collared to the division using steel collars. Single skinned spiroducts and aluminum alloy ducts, not exceeding 0.075 square metre should be passed through a steel sleeve having a length and thickness of 900mm and 1mm respectively, collared to the division using steel collars. The gap between the sleeve and the duct should be effectively packed with a non-combustible material and the ends sealed with a suitable flexible sealant.

Steel ducts exceeding 0.075 square metre in cross sectional area should be connected to a steel spigot having a length and thickness of not less than 900 mm and 3mm respectively collared to the division using steel collars or passed through a sleeve of similar dimensions collared to the division. The gap between the sleeve and the duct should be effectively packed with a non-combustible material and the end sealed with a suitable flexible sealant. Double and single skinned spiroducts and aluminum alloy ducts, exceeding 0.075 square metre should be passed through a sleeve having a length and thickness of 900mm and 3mm respectively, collared to the division using steel collars. The gap between the sleeve and the duct should be effectively packed with a non combustible material and the ends sealed with a suitable flexible sealant.

4.13.3.3 When any duct passes through a 'B' Class division of B-15 standard, the ducts sleeves or spigots should be insulated on one side of the division for a distance of at least 380mm from the division with an approved mineral wool insulation of A-15 standard attached to the satisfaction of the attending surveyor. Figures 41 and 42 illustrate acceptable arrangements.

4.13.4 Fire dampers

4.13.4.1 Where a ventilation duct other than those mentioned in 4.13.1.2, passes through an 'A' Class bulkhead or deck a fire damper which is capable of being manually closed from each side of the division is to be fitted adjacent to the division. Where the sectional area of the duct exceeds 0.075 square metres, a fail safe automatic closing fire damper capable of being manually closed from each side of the division, should be fitted adjacent to the division.

4.13.4.2 The thickness of the steel coamings or spigots incorporating fire dampers for closing openings in ventilation ducts should be obtained as follows:

Width or Diameter of Duct	Minimum Thickness of Coaming
Up to and including 300mm	3mm
760mm and over	5mm

For widths or diameters of ducts exceeding 300mm but not exceeding 760mm, the thickness of the coaming or spigot shall be obtained by interpolation.

4.13.4.3 Although fire dampers are required by the regulations to be capable of being manually operated from either side of a division, special consideration will be given to operation from one side of the division only. For example, a fire

damper fitted to a duct serving a locked store room would only require to be operable from outside the space.

4.13.4.4 Manual control of fire dampers is required to be by means of a handle connected directly to the spindle of the damper blade and is to be independent of and capable of overriding any automatic or remote means of control.

4.13.4.5 All fire dampers are to be provided with an indicator which shows whether the fire damper is open or closed The open/closed indicator should be connected directly to the damper blade and is to be independent of any pneumatic or electrical control system. The "open" and "closed" position markings are to be permanently attached to the outside of the damper housing.

4.13.4.6 In order to satisfy the requirements to operate a fire damper manually from both sides of a bulkhead or deck as indicated in sub-paragraphs 4.13.1.2 and 4.13.3.1, a damper may be fitted on each side of the division within a common coaming or spigot, the dampers being operated independently of each other. Only one of the two dampers need be capable of being operated automatically when automatic operation is required by the regulations. When a duct has a large sectional area it may be necessary to increase the length of the coaming or spigot beyond 900mm in order to accommodate the two dampers within its length.

4.13.4.7 The damper blades must be positioned to ensure that any means of operating the damper is clear of the division or the insulation fitted to the division. Since a coaming or spigot is required to be insulated to the same standard as the division, the external fittings must be raised sufficiently clear of the coaming or spigot to enable the insulation to be fitted and the damper to be operated.

4.13.4.8 An access opening measuring 100mm x 100mm and fitted with a hinged steel cover incorporating a locking device, is to be provided in the coaming or spigot for inspecting the damper blade and for testing, inspecting and replacing the means of automatically operating the damper.

4.13.4.9 When a fire damper is required to operate automatically, the means of operation should be located inside the coaming or spigot such that it can be activated by hot gases passing through the ventilation ducting. The means of operation should be activated at temperatures within the range of 68° to 79° inclusive except that in exhaust ducts serving spaces with high ambient temperatures such as galleys and drying rooms the temperature at which the means of operation is activated may be increased to not more than 30° above the maximum deckhead temperature. When the means of operating a fire damper automatically is a spring and fusible link, the link is required to

be capable of being released manually from outside the duct by withdrawing the pin over which the link is hooked.

4.13.4.10 It is recognized that the closing of fire dampers could take a considerable amount of time even if only one main vertical zone required to be "closed off". In view of this, consideration should be given to the fitting of a system which will allow their remote closing, either simultaneously or in groups from a continuously manned control station. The system should be arranged so that the fire dampers will automatically close when the ventilation fans are stopped or the control system is disrupted.

4.13.4.11 Fire dampers are not required to be fitted in a duct which passes through a space surrounded by 'A' Class divisions but has no openings into the space, provided that the duct complies with the following:

(a) has the same thickness as the steel spigot referred to in sub-paragraph 4.13.3.1;

(b) is adequately supported and stiffened; and

(c) is insulated to the same 'A' Class standard as the division through which it passes or to the higher standard when the divisions have differing 'A' Class standards.

Figure 34 illustrates this arrangement.

However, the dispensing of fire dampers in this manner is not permitted when a duct passes through a main zone division.

4.13.4.12 Notwithstanding sub-paragraph 4.13.3.10, when a duct serves spaces bounded by 'A' Class divisions and which are situated on each side of another space into which the duct has no openings, fire dampers are still required at each end of the 'A' Class ducting in order to maintain the integrity of the two outer spaces from each other. Figure 34 illustrates this arrangement.

4.13.4.13 Fire dampers are required to be tested in accordance with the procedure described in TP439, "Structural Fire Protection Standards: Testing and Approval Procedures".

4.13.5 Means of closing main inlets and outlets

4.13.5.1 The main inlets and outlets of ventilation systems should be provided with effective means of closure in the event of fire. Figure 45 illustrates acceptable arrangements.

4.13.6 Spaces fitted with a gas fire extinguishing system

4.13.6.1 When the ventilation ducting serving a space or group of spaces which is fitted with a fixed gas fire extinguishing system passes through any space not served by the system, the ducting should be of steel and of 'A' Class gastight construction.

4.13.7 Spaces in which fire extinguishing gas cylinders are stored

4.13.7.1 The ventilation system serving a space in which gas cylinders are stored should not serve any other space and should be capable of freeing the space of any gas which may leak from the cylinders. Any ducting of such a system which passes through any other space should be of steel and of 'A' Class gastight construction.

4.14 Ventilation Systems (cargo ships and tankers)

4.14.1 General

The ventilation systems serving the following spaces should be independent of accommodation spaces, service spaces and control stations and should be independent of each other:

(a) stairway enclosures;

(b) a galley;

(c) a machinery space;

(d) a cargo space; and

(e) a ro-ro cargo space.

4.14.2 Duct material

4.14.2.1 Ventilation ducts are required to be of non-combustible materials.

4.14.2.2 Short ducts, not exceeding 2m in length and with a cross section area not exceeding 0.02 square metre may be constructed of combustible material, subject to the following conditions:

(a) the material should have low flame spread characteristics;

(b) they may only be used at the end of a ventilation device;

(c) they should not be situated less than 600mm along the duct, from an opening in an 'A' or 'B' Class ceiling.

4.14.3 Duct penetrations

4.14.3.1 Where ventilation ducts pass through 'A' Class bulkheads or decks, the openings are required to be fitted with steel spigots unless the ducts passing through the bulkhead or deck are of steel of an equivalent thickness. The spigot shall have a thickness of at least 3mm and a length of at least 900mm. When passing through bulkheads, this length shall be divided preferably into 450mm on each side of the bulkhead. These spigots shall be insulated to the same fire integrity and insulation value as the deck or bulkhead through which the duct passes. Figure 32 and 33 illustrate this arrangement.

4.14.3.2 Where ventilation ducts pass through 'B' Class bulkheads, ceilings and linings, the ducts are to be fitted with collars, steel spigots or sleeves. Steel ducts and double skinned spiroducts, not exceeding 0.075 square metre in cross sectional area should be collared to the division using steel collars. Single skinned spiroducts and aluminum alloy ducts, not exceeding 0.075 square metre should be passed through a steel sleeve having a length and thickness of 900mm and 1mm respectively, collared to the division using steel collars. The gap between the sleeve and the duct should be effectively packed with a non-combustible material and the ends sealed with a suitable flexible sealant. Steel ducts exceeding 0.075 square metre in cross sectional area should be connected to a steel spigot having a length and thickness of not less than 900 mm and 3mm respectively collared to the division using steel collars or passed through a sleeve of similar dimensions collared to the division. The gap between the sleeve and the duct should be effectively packed with a non-combustible material and the end sealed with a suitable flexible sealant. Double and single skinned spiroducts and aluminum alloy ducts, exceeding 0.075 square metre should be passed through a sleeve having a length and thickness of 900mm and 3mm respectively, collared to the division using steel collars. The gap between the sleeve and the duct should be effectively packed with a non combustible material and the ends sealed with a suitable flexible sealant. Figures 41 and 42 illustrate the above requirements.

4.14.3.3 When any duct passes through a 'B' Class division of B-15 standard, the ducts sleeves or spigots should be insulated on one side of the division for a distance of at least 380mm from the division with an approved mineral wool insulation of A-15 standard attached to the satisfaction of the attending surveyor.

4.14.4 Fire dampers

4.14.4.1 Where a ventilation duct greater than 0.075 square metre in cross sectional area passes through an 'A' Class bulkhead or deck, a fail-safe automatic closing type fire damper which is capable of being manually closed from each side of the division is to be fitted adjacent to the division.

4.14.4.2 The thickness of the steel coamings or spigots incorporating fire dampers for closing openings in ventilation ducts should be obtained as follows:

Width or Diameter of Duct	Minimum Thickness of Coaming
Up to and including 300mm	3mm
760mm and over	5mm

For widths or diameters of ducts exceeding 300mm but not exceeding 760mm, the thickness of the coaming or spigot shall be obtained by interpolation.

4.14.4.3 Although fire dampers are required by the regulations to be capable of being manually operated from either side of a division, special consideration will be given to operation from one side of the division only. For example, a fire damper fitted to a duct serving a locked store room would only require to be operable from outside the space.

4.14.4.4 Manual control of fire dampers is required to be by means of a handle connected directly to the spindle of the damper blade and is to be independent of and capable of overriding any automatic or remote means of control.

4.14.4.5 All fire dampers are to be provided with an indicator which shows whether the fire damper is open or closed The open/closed indicator should be connected directly to the damper blade and is to be independent of any pneumatic or electrical control system. The "open" and "closed" position markings are to be permanently attached to the outside of the damper housing.

4.14.4.6 In order to satisfy the requirements to operate a fire damper manually from both sides of a bulkhead or deck as indicated in sub-paragraph 4.14.4.1, a damper may be fitted on each side of the division within a common coaming or spigot, the dampers being operated independently of each other. Only one of the two dampers need be capable of being operated automatically. When a duct has a large sectional area it may be necessary to increase the length of the coaming or spigot beyond 900mm in order to accommodate the two dampers within its length.

4.14.4.7 The damper blades must be positioned to ensure that any means of operating the damper is clear of the division or the insulation fitted to the division. Since a coaming or spigot is required to be insulated to the same standard as the division, the external fittings must be raised sufficiently clear of the coaming or spigot to enable the insulation to be fitted and the damper to be operated.

4.14.4.8 An access opening measuring 100mm x 100mm and fitted with a hinged steel cover incorporating a locking device, is to be provided in the coaming or spigot for inspecting the damper blade and for testing, inspecting and replacing the means of automatically operating the damper.

4.14.4.9 When a fire damper is required to operate automatically, the means of operation should be located inside the coaming or spigot such that it can be activated by hot gases passing through the ventilation ducting. The means of operation should be activated at temperatures within the range of 68° to 79°C inclusive except that in exhaust ducts serving spaces with high ambient temperatures such as galleys and drying rooms the temperature at which the means of operation is activated may be increased to not more than 30° above the maximum deckhead temperature. When the means of operating a fire damper automatically is a spring and fusible link, the link is required to be capable of being released manually from outside the duct by withdrawing the pin over which the link is hooked.

4.14.4.10 Fire dampers are not required to be fitted in a duct which passes through a space surrounded by 'A' Class divisions but has no openings into the space, provided that the duct complies with the following:

(a) has the same thickness as the steel spigot referred to in sub-paragraph 4.13.3.1;

(b) is adequately supported and stiffened; and

(c) is insulated to the same 'A' Class standard as the division through which it passes or to the higher standard when the divisions have differing 'A' Class standards.

Figure 34 illustrates this arrangement.

4.14.5 Means of closing main inlets and outlets

4.14.5.1 The main inlets and outlets of ventilation systems should be provided with effective means of closure in the event of fire. Figure 45 illustrates acceptable arrangements.

4.14.6 Spaces fitted with a gas fire extinguishing system

4.14.6.1 When the ventilation ducting serving a space or group of spaces which is fitted with a fixed gas fire extinguishing system passes through any space not served by the system, the ducting should be of steel and of 'A' Class gastight construction.

4.14.7 Spaces in which fire extinguishing gas cylinders are stored

4.14.7.1 The ventilation system serving a space in which gas cylinders are stored should not serve any other space and should be capable of freeing the space of any gas which may leak from the cylinders. Any ducting of such a system which passes through any other space should be of steel and of 'A' Class gastight construction.

4.15 Window and Sidelight Boxes

4.15.1 When a lining at the ship's side or deckhouse side is the insulating medium for an 'A' Class division, a 'B' Class division or a 'C' Class division, the opening in the lining in way of any window or sidelight should be effectively boxed-in using the same material and thickness of the lining except that:

(a) when the lining is a 'B' Class division of B-0 standard or a 'C' Class division, steel having a minimum thickness of 1.5mm may be used to box-in the opening; and

(b) in the case of a vertical sliding window, the lower edge of the box may be formed by the deck plating.

4.15.2 The construction of the boxes should be similar to that of the lining as shown on the manufacturer's approved drawing and to the satisfaction of the attending surveyor.

4.15.3 Window and sidelight boxes of fibre reinforced plastic (FRP) construction may be fitted in addition to, but not instead of the non-combustible boxes and in the case of passenger ships the FRP boxes should be included in the total volume of combustible facings, moulding etc. referred to in the regulations.

4.15.4 Notwithstanding the requirements described above, when the structure is of steel the non-combustible boxes may be dispensed with in:

(a) a space not exceeding 6 metres in length measured along the lining at the ship's side or deckhouse side; or

(b) a space of any length containing furniture and furnishings of restricted fire risk;

provided that in either case, the bulkheads and ceilings bounding the space are carried to the ship's side or deckhouse side.

4.15.5 FRP window and sidelight boxes should not be fitted on tankers, around windows and sidelights in the exterior boundaries of superstructures and deckhouses referred to in sub-section 147(2) of Part IX of the Hull Construction Regulations.

4.16 Restricted Fire Risk Furniture

4.16.1 On passenger vessels, restricted fire risk furniture may be used in order to reduce the fire rating values of bulkheads and decks. Case (built in) furniture is required to be constructed entirely of non-combustible materials except for working surfaces, where a combustible veneer not exceeding 2mm in thickness is permitted. The remaining exposed surfaces of case furniture are to have low flame spread characteristics.

4.16.2 Free standing furniture, such as chairs, tables or sofas, must have frames of non-combustible materials. The frame is generally defined as the components of structural support. The original type chair envisioned by the regulations consisted of a steel frame with loose bottom and back cushions.

4.17 Special Category Spaces

4.17.1 By definition, special category spaces are enclosed spaces used for the carriage of motor vehicles with fuel in their tanks for their own propulsion and to which passengers have access. Partially enclosed or open decks used for the carriage of motor vehicles with fuel in their tanks for their own propulsion are not considered special category spaces but are subject to special requirements. The fire rating of the boundaries of compartments adjacent to such spaces are to be determined as follows:

(a) obtain the fire rating of the division from Tables 1 and 3 of Schedule B Of TP2237 by classing the car deck area as a category (11) space;

(b) reduce the fire rating obtained from the tables by one rating, eg., if the rating obtained from the Tables is Class A-60, the actual rating will be Class A-30.

4.18 Combined Galley and Mess Room

4.18.1 A galley and an adjoining mess room may be combined provided:

(a) the total area of the combined space does not exceed 50m^2

(b) if the total area of the combined space exceeds 28m² two means of escape are to be provided; and

(c) the combined space is to be classified as a galley with respect to the integrity of its boundaries.

4.19 Manual Sprinkler Systems on Vehicle Decks

4.19.1 The present regulations contained in Part III of the Hull Construction Regulations describes the requirements for dividing the ship into main vertical zones by "A" Class divisions and the fitting of a manually operated sprinkler system on vehicle decks. Sub-section 42(4) of these regulations allows water curtains to be fitted in lieu of the main vertical zone bulkheads in a vehicle deck. The detailed requirements for the manually operated sprinkler system and the water curtains referred to above, are contained in Schedule "VI" of the present Fire Detection and Extinguishing Equipment Regulations.

4.19.2 In the case of passenger ships, the Keels of which were laid, were converted, or were transferred to Canadian registry on or after March 22,1967, only Method I of fire protection is to be adopted. The Board has authorized the use of IMO resolution A.122(V) as being equivalent to the requirements of Method I contained in Part III of the Hull Construction Regulations and the detailed requirements of this resolution are contained in Part I of TP2237, Equivalent standards for Fire Protection of Passenger Ships.

4.19.3 Section 7 of Part I of TP2237 describes the requirements for the protection of vehicle spaces. The basic principle underlying this regulation is that as normal main vertical zoning may not be practicable in this type of space, equivalent protection must be obtained on the basis of a horizontal zone concept and the provision of a manually operated, fixed pressure water-spraying system. Schedule VI of the draft Fire Protection, Detection and Extinguishing Equipment Regulations describes in detail, the system referred to above.

4.19.4 If an owner requests that water curtains be removed from existing ships, the sprinkler system must be modified to comply with the requirements for a manually operated, fixed pressure water-spraying system as described in Schedule VI of the draft Fire Protection, Detection and Extinguishing Equipment Regulations and the boundaries insulated as described in Part I of TP2237.

4.20 Methods of Fire Protection for Cargo Ships and Tankers

4.20.1 One of the following methods of fire protection is required to be adopted in the accommodation and service spaces of a cargo ship:

(a) Method IC. All internal divisional bulkheads are to be "A","B" or "C" Class divisions and an automatic fire detection and alarm system fitted.

(b) Method IIC. An automatic sprinkler system and an automatic fire detection and alarm system fitted, generally with no restriction on the type of internal divisional bulkheads.

(c) Method IIIC. An automatic fire detection and alarm system fitted, generally with no restriction on the type of internal divisional bulkheads except that the area of any accommodation space or spaces bounded by "A" and/or "B" Class divisions is not to exceed 50m^2. The Board may permit an increase in this area with respect to public spaces.

4.20.2 In all three methods, corridor bulkheads are required to be 'B' Class divisions.

4.20.3 In the case of tankers, only Method IC is permitted.

4.21 Watertight and Weathertight Doors

4.21.1 Doors required to be both watertight and 'A' Class fire rated need only meet the watertight requirements provided the door is not fitted with a combustible gasket. Doors required to be both gastight and 'A' Class fire rated need only meet the 'A' class requirements. Doors required to be both weathertight and 'A' Class fire rated in partially enclosed or open decks used for the carriage of motor vehicles with fuel in their tanks for their own propulsion to which passengers have access are to be specially considered. In general, they need only meet the 'A' Class requirements provided the sill heights are in accordance with regulatory requirements. However, depending on the location and class of voyage, the fitting of weathertight doors may be necessary.

4.22 Concealed or Inaccessible Spaces

4.22.1 The spread of flame in concealed areas is a matter of great concern. Regulations require that surfaces including grounds in concealed or inaccessible spaces in accommodation, service spaces and control stations should have low flame spread characteristics. This requirement applies to the surfaces of decks, bulkheads and linings which form the interior boundaries of the concealed or inaccessible spaces.

4.23 Fire Control Plans

4.23.1 The requirements for fire control plans are described in Sections 40, 198 and 247 of the Hull Construction Regulations and also in Part 1(23), Part II(25) and Part III of TP2237, "Equivalent Standards for the Fire Protection of Passenger Ships". In each of the above references the items to be shown on the fire control plans are clearly defined.

4.23.2 A review of fire control plans forwarded to Headquarters has indicated that additional items ranging from lists of lifesaving equipment to details of ladders and stairways are still being shown on these plans. These additional items detract from the main purpose of the fire control plan which is to provide clearly marked information for the use of the ship's officers and shore based fire fighters in a fire emergency, and therefore should not be shown.

4.23.3 The International Maritime Organization (IMO) has recognized that the use of universally understood symbols would greatly increase the usefulness of fire control plans, both for the ship's crew and the shore-based fire fighters. IMO has adopted a set of such symbols and has urged member Governments to recommend their use to shipowners, shipbuilders and naval architects. In view of this the Ship Safety branch recommends their use on the fire control plans required by the regulations.

4.23.4 Copies of the IMO symbols have been distributed to Ship Safety offices and to the industry.

4.23.5 Fire control plans should not be submitted to Headquarters for approval but should be checked against the ship during the 'first inspection'. When the attending surveyor is satisfied that the contents of the plan are accurate, he should notate the plan with the statement "VERIFIED CORRECT", followed by his name and date. If any changes are made to the ship which should be reflected on the fire control plan, the owner should be requested to have it modified accordingly and verified by the attending surveyor. The plan should be again notated by the attending surveyor as described above.

4.24 Use of Polyurethane and Other Organic Foam Materials

4.24.1 The use of polyurethane and other organic foam as an insulation material is restricted to non-passenger ships and is only to fitted in low fire risk areas such as fish holds, cargo holds, or refrigerated spaces. Under no circumstances are these materials to be used in machinery spaces, galleys, accommodation spaces, control stations or other similar spaces where a fire hazard may exist. The detailed requirements for the fitting of this material is described in Technical References No.8.

4.25 Windows

4.25.1 The requirements for 'A' Class integrity does not generally apply to windows fitted in the exterior boundaries of the ship. However, windows fitted in way of lifeboat, liferaft and lifesaving chute launching areas are to be fire rated. Fire rated windows are required to be tested in accordance with the procedure described in TP439, "Structural Fire Protection Standards: Testing and Approval Procedures".

4.26 Tankers - Protection of Exterior Boundaries

4.26.1 Part IX of the Hull Construction Regulations requires that the exterior boundaries of superstructures and deckhouses of tankers receive special consideration with respect to fire insulation and openings.

4.26.2 The exterior boundaries of superstructures and deckhouses which enclose accommodation areas including any overhanging decks supporting accommodation areas require to be insulated with an 'A-60' insulation on the parts which face the cargo tank area and on the side parts for a distance of at least 3 metres.

4.26.3 Each 3 metre minimum length of insulated side part of the superstructure and deckhouse is to be measured horizontally and parallel to the centre line of the ship as illustrated in Figure 46.

4.26.4 Any overhanging decks supporting accommodation should be insulated for the whole of its length. An overhanging deck would best be insulated on the upper side using an approved 'A-60' deck covering rather than applying insulation to the underside where it would be exposed to the weather as illustrated in Figure 47.

4.26.5 Any step in the exterior boundaries of superstructures and deckhouses which is not an overhanging deck requires to be insulated with an 'A-60' insulation on the parts which face the cargo tank area and on the side parts for a distance of at least 3 metres.

4.26.6 Doors, air inlets and other openings are not permitted to be fitted in the parts of the exterior boundaries of superstructures or deckhouses facing the cargo tank area and on the sides for a distance of at least 5 metres.

4.26.7 Doors giving access to cargo control stations, provision rooms or store rooms may be fitted within the areas described in 4.26.6 provided that such a space does not give access to accommodation spaces, service spaces and control stations. When an access door is allowed to be fitted to such a space, the boundaries of the space, including the deckhead but excluding the boundary facing the cargo tank area should be insulated to an A-60 standard as shown in Figure 48. The boundaries of such a space situated

forward of the cargo tank area need not be insulated when it is a superstructure or deckhouse which does not enclose accommodation and the space does not give access to any service space or control station.

4.26.8 Windows and port lights within the area described in 4.24.6, except wheelhouse windows are to be of the fixed non-opening type.

4.26.9 Port lights in the first tier on the main deck within the area described in 4.26.6 should be provided with inside covers of steel having a minimum thickness of 1.5 mm.

4.27 Ships Transferred to Canadian Registry

4.27.1 As stated in Section 16 of the Hull Inspection Regulations, "Steamships transferred from registry elsewhere than in Canada to Canadian registry are deemed to be "new ships".....".

4.27.2 Past experience has shown that ascertaining the standard of structural fire protection fitted on the ship has often been a difficult and lengthy task, particularly with respect to the identification of fire rated and non-combustible materials.

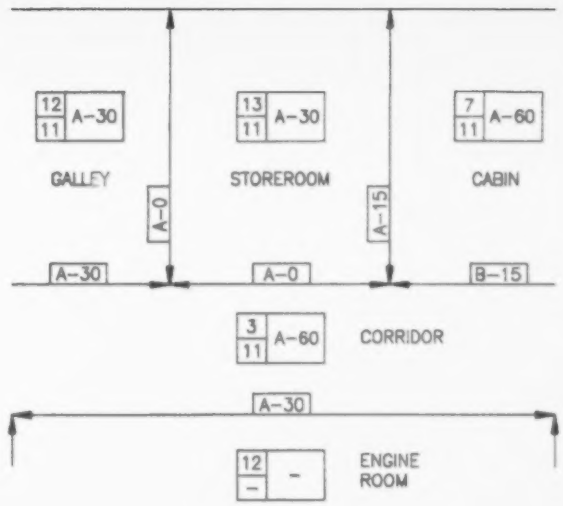
4.27.3 Surveyors should make every attempt to obtain the necessary drawings reflecting the structural fire protection arrangements fitted on the ship together with any data which can positively identify the materials of construction. If the materials can not be positively identified, replacement with approved materials or testing of samples of the materials fitted to ascertain their fire rating will be required.

4.27.4 In summary, prospective buyers of foreign registered ships should be advised of our regulatory requirements with respect to structural fire protection and the implications of non-compliance.

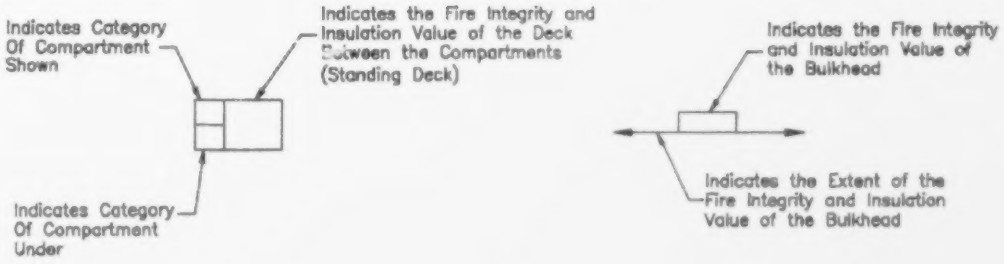
APPENDIX 1

ILLUSTRATIONS

The following sketches are intended for guidance only, and in no way change or modify regulatory requirements, or the details of construction and installation for approved products, described in the appropriate certificate of approval and shown on the manufacturers approved drawing(s).



PART PLAN VIEW OF FIRE ZONE PLAN

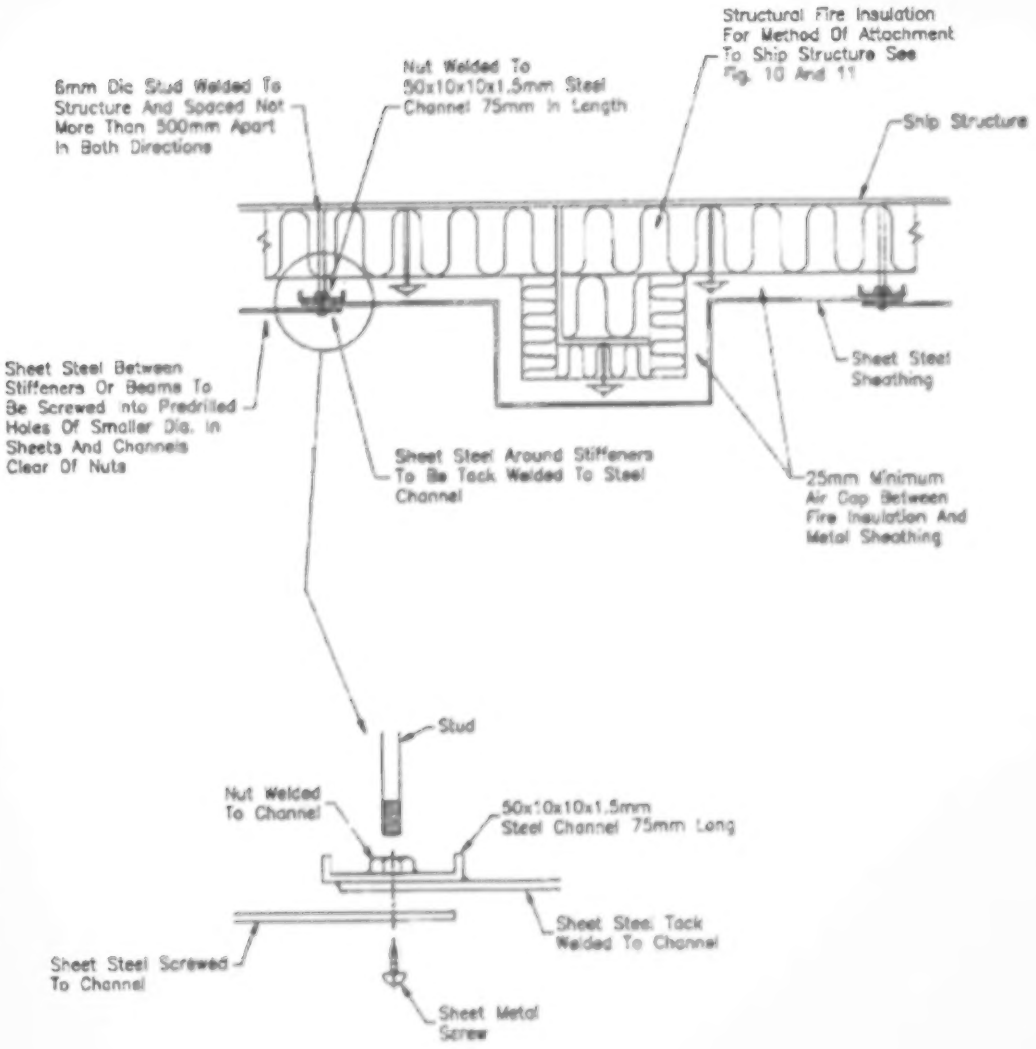


EXPLANATION OF SYMBOLS

RECOMMENDED METHOD OF SHOWING FIRE INTEGRITY
AND INSULATION VALUES ON FIRE ZONE PLANS

FIGURE 1

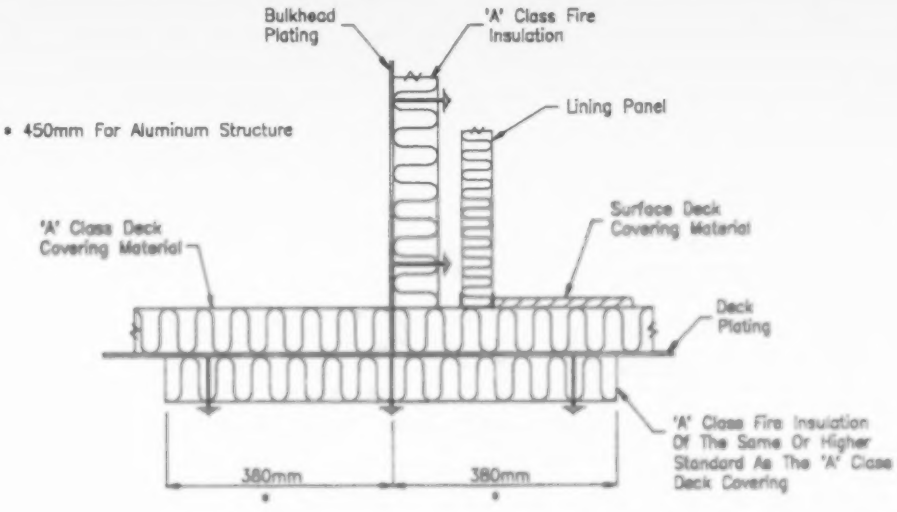
Ref. 2.1.1


Structural Fire Insulation For Method Of Attachment To Ship Structure See Fig. 10 And 11
6mm Dia Stud Welded To Structure And Spaced Not More Than 500mm Apart In Both Directions
Nut Welded To 50x10x10x1.5mm Steel Channel 75mm In Length
Ship Structure
Sheet Steel Between Stiffeners Or Beams To Be Screwed Into Predrilled Holes Of Smaller Dia. In Sheets And Channels Clear Of Nuts
Sheet Steel Sheathing
Sheet Steel Around Stiffeners To Be Tack Welded To Steel Channel
25mm Minimum Air Gap Between Fire Insulation And Metal Sheathing
Stud
Nut Welded To Channel
50x10x10x1.5mm Steel Channel 75mm Long
Sheet Steel Tack Welded To Channel
Sheet Steel Screwed To Channel
Sheet Metal Screw

DETAILS OF PROTECTIVE METAL SHEATHING FOR VAPOUR BARRIERS

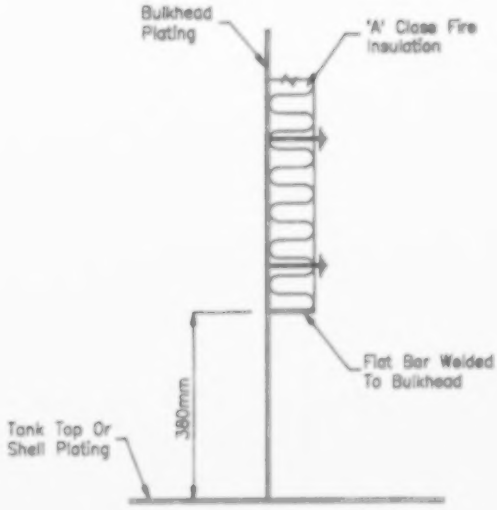
FIGURE 2

Ref. 3.7.2


Bulkhead Plating
'A' Class Fire Insulation
Lining Panel
• 450mm For Aluminum Structure
'A' Class Deck Covering Material
Surface Deck Covering Material
Deck Plating
'A' Class Fire Insulation Of The Same Or Higher Standard As The 'A' Class Deck Covering
380mm
380mm

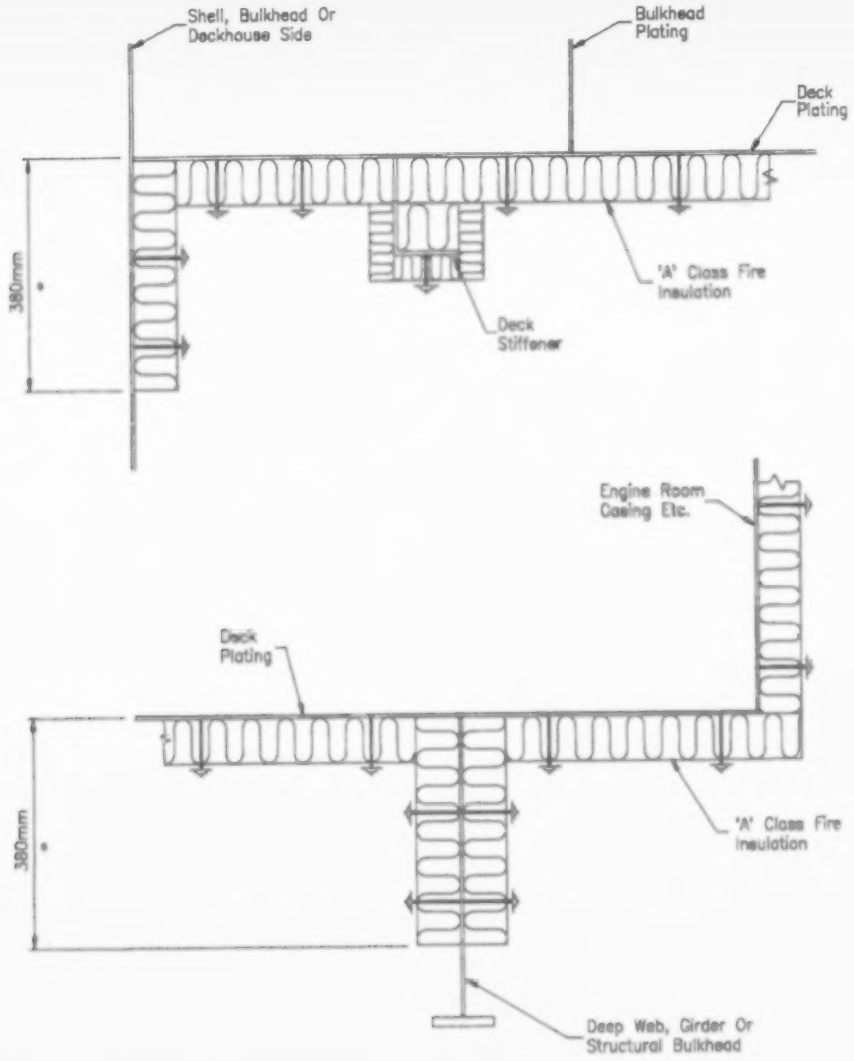
SECTION IN WAY OF AN 'A' CLASS DECK SHOWING THE TERMINATION OF THE 'A' CLASS BULKHEAD FIRE INSULATION

FIGURE 3



SECTION IN WAY OF THE TANK TOP OR BOTTOM SHELL PLATING SHOWING THE TERMINATION OF THE 'A' CLASS BULKHEAD FIRE INSULATION

FIGURE 4

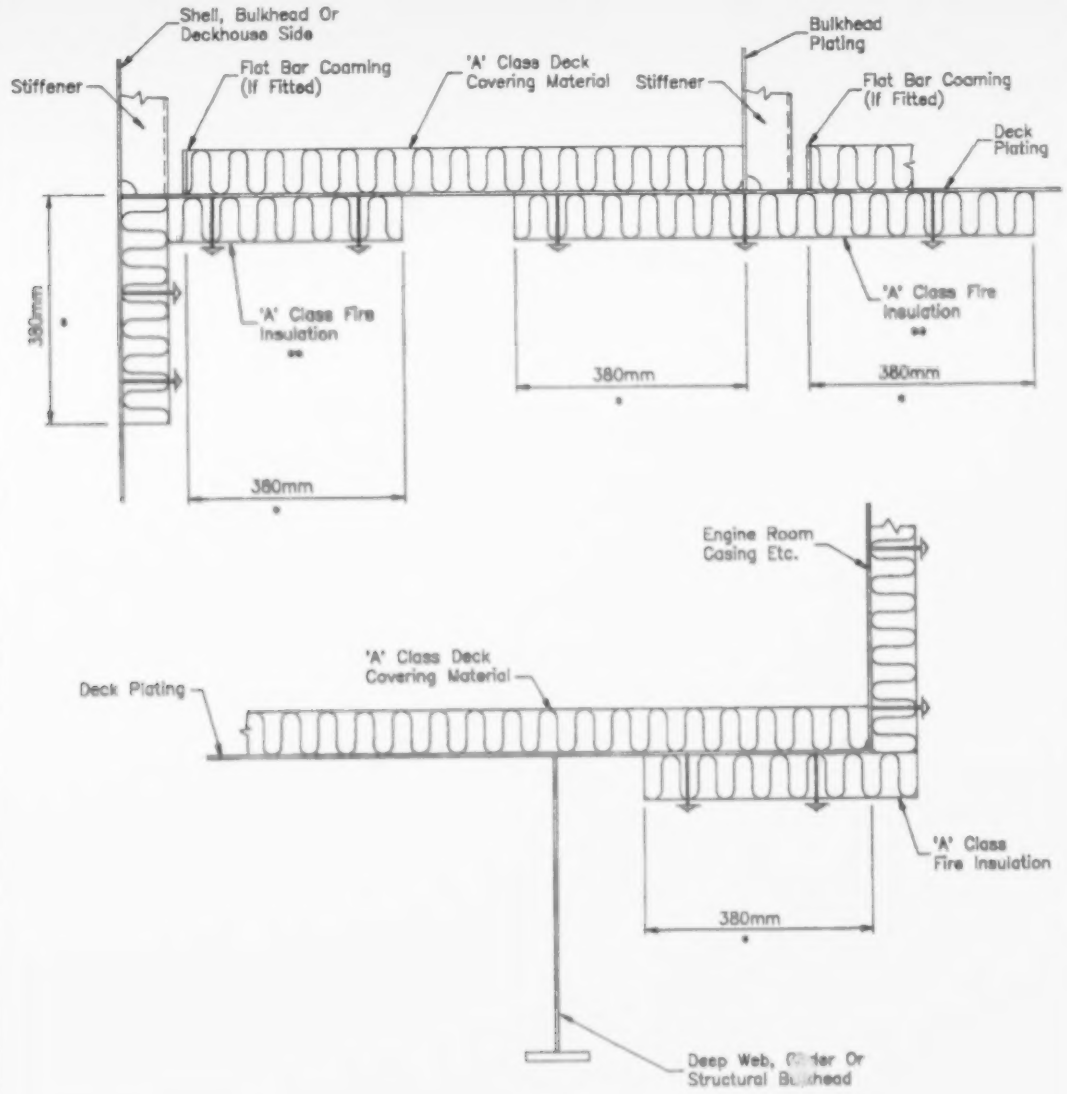


* 450mm For Aluminum Structure

MEANS TO PREVENT HEAT TRANSMISSION AT THE BOUNDARIES, INTERSECTIONS, AND TERMINAL POINTS OF REQUIRED THERMAL BARRIERS (WHEN STRUCTURAL FIRE INSULATION IS FITTED TO THE UNDERSIDE OF THE DECK)

FIGURE 5

Ref. 4.2.2.3 & 4.2.10.1



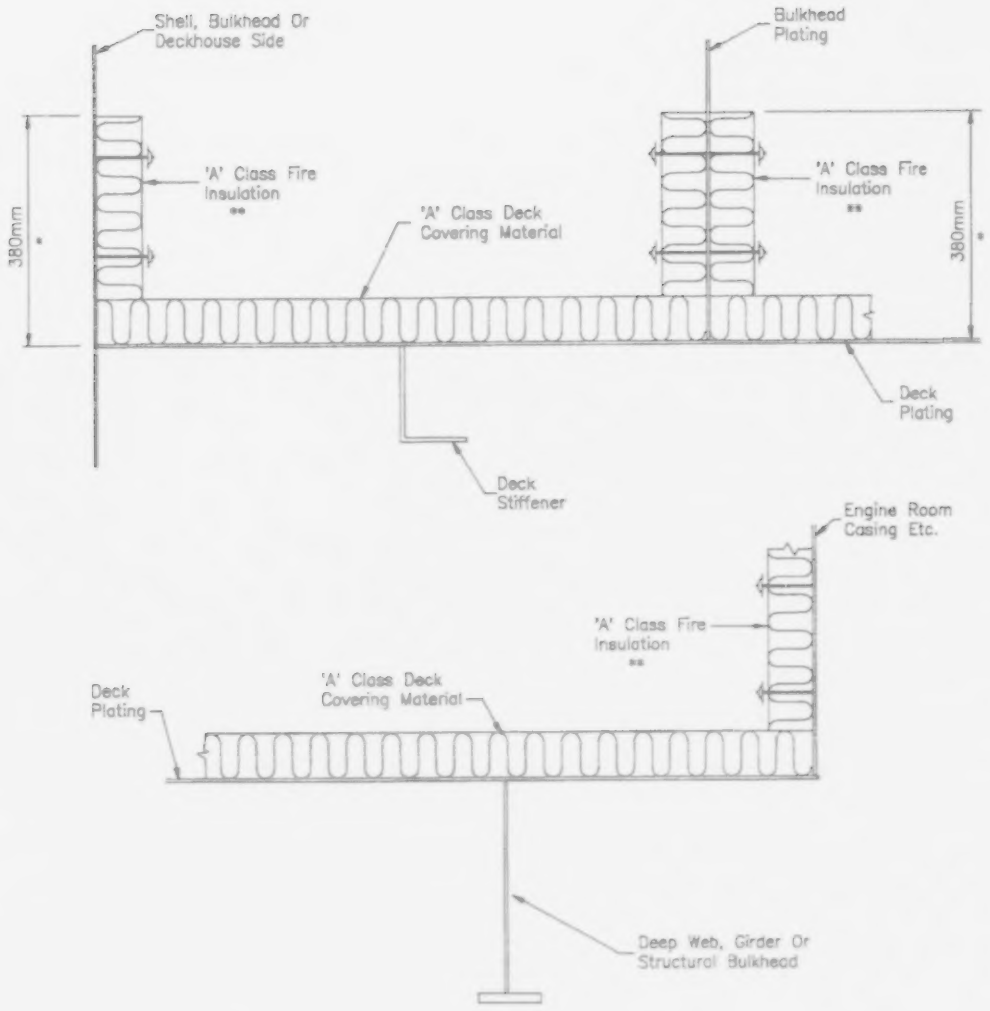
* 450mm for Aluminum Structure

** 'A' Class Fire Insulation To Be Of The Same Or Higher Standard As The 'A' Class Deck Covering

MEANS TO PREVENT HEAT TRANSMISSION AT THE BOUNDARIES, INTERSECTIONS, AND TERMINAL POINTS OF REQUIRED THERMAL BARRIERS (WHEN STRUCTURAL FIRE INSULATION IS FITTED ON TOP OF THE DECK)

FIGURE 6

Ref. 4.2.2.3, 4.2.2.4 & 4.2.10.1



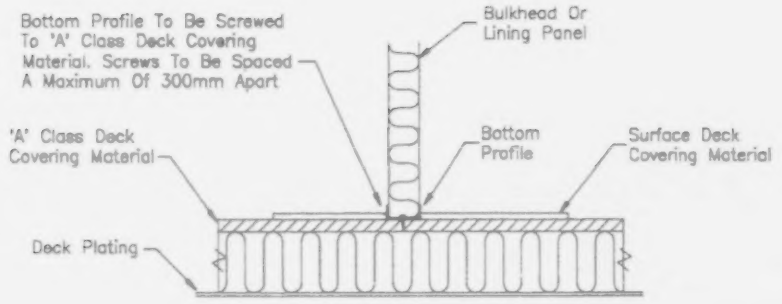
* 450mm For Aluminum Structure

** 'A' Class Fire Insulation To Be Of The Same Or Higher Standard As The 'A' Class Deck Covering

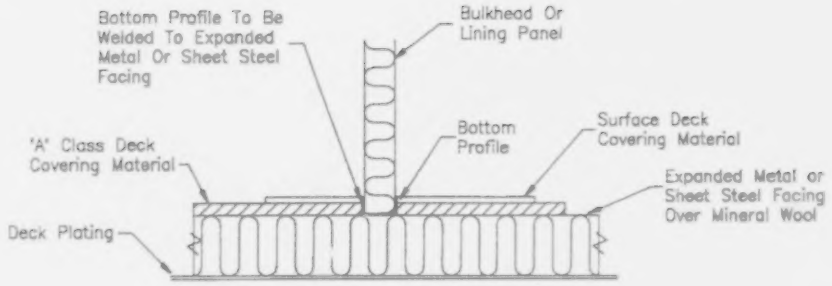
MEANS TO PREVENT HEAT TRANSMISSION AT THE BOUNDARIES, INTERSECTIONS, AND TERMINAL POINTS OF REQUIRED THERMAL BARRIERS (WHEN STRUCTURAL FIRE INSULATION IS FITTED ON TOP OF THE DECK)

FIGURE 7

Ref. 4.2.2.3, 4.2.2.4 & 4.2.10.1


Bottom Profile To Be Screwed To 'A' Class Deck Covering Material. Screws To Be Spaced A Maximum Of 300mm Apart
Bulkhead Or Lining Panel
'A' Class Deck Covering Material
Bottom Profile
Surface Deck Covering Material
Deck Plating

METHOD 1

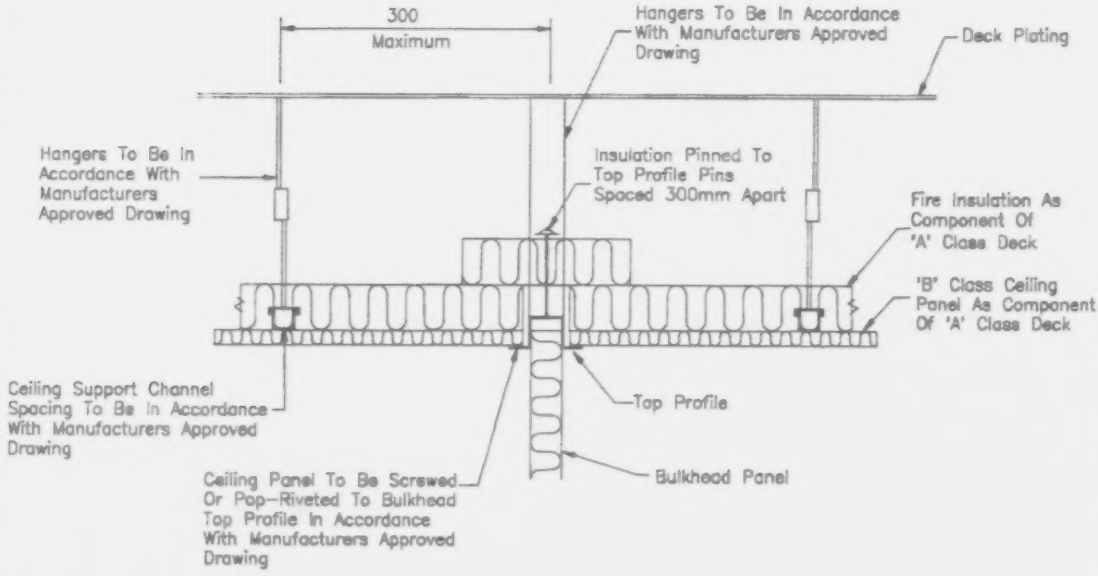

Bottom Profile To Be Welded To Expanded Metal Or Sheet Steel Facing
Bulkhead Or Lining Panel
'A' Class Deck Covering Material
Bottom Profile
Surface Deck Covering Material
Expanded Metal or Sheet Steel Facing Over Mineral Wool
Deck Plating

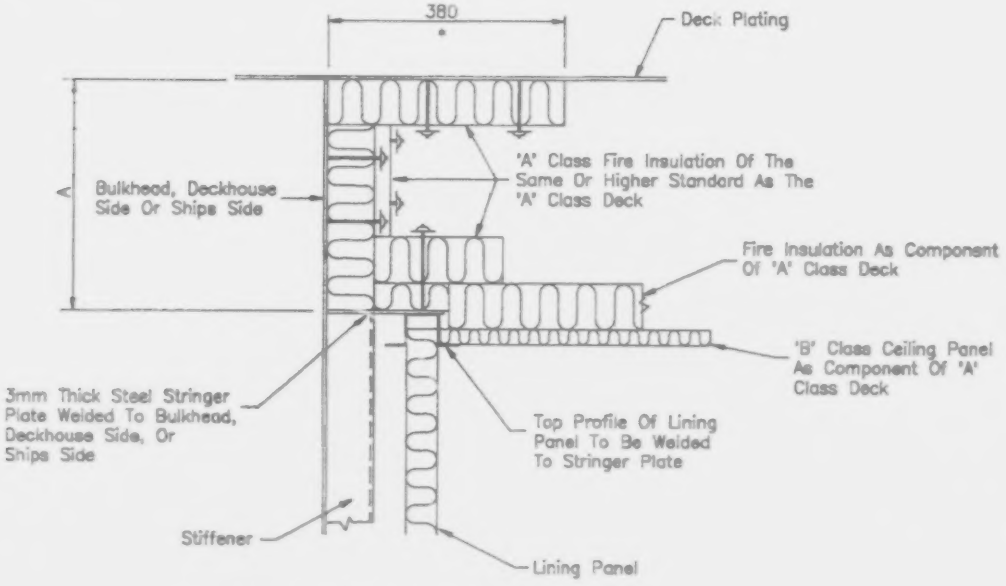
METHOD 2

METHOD OF ATTACHING 'B' CLASS, 'C' CLASS, OR COMBUSTIBLE BULKHEAD OR LINING PANELS TO AN 'A' CLASS DECK COVERING MATERIAL

FIGURE 8

Ref. 4.2.5.3 & 4.4.5.1


300
Maximum
Hangers To Be In Accordance With Manufacturers Approved Drawing
Deck Plating
Hangers To Be In Accordance With Manufacturers Approved Drawing
Insulation Pinned To Top Profile Pins Spaced 300mm Apart
Fire Insulation As Component Of 'A' Class Deck
'B' Class Ceiling Panel As Component Of 'A' Class Deck
Ceiling Support Channel Spacing To Be In Accordance With Manufacturers Approved Drawing
Top Profile
Bulkhead Panel
Ceiling Panel To Be Screwed Or Pop-Riveted To Bulkhead Top Profile In Accordance With Manufacturers Approved Drawing

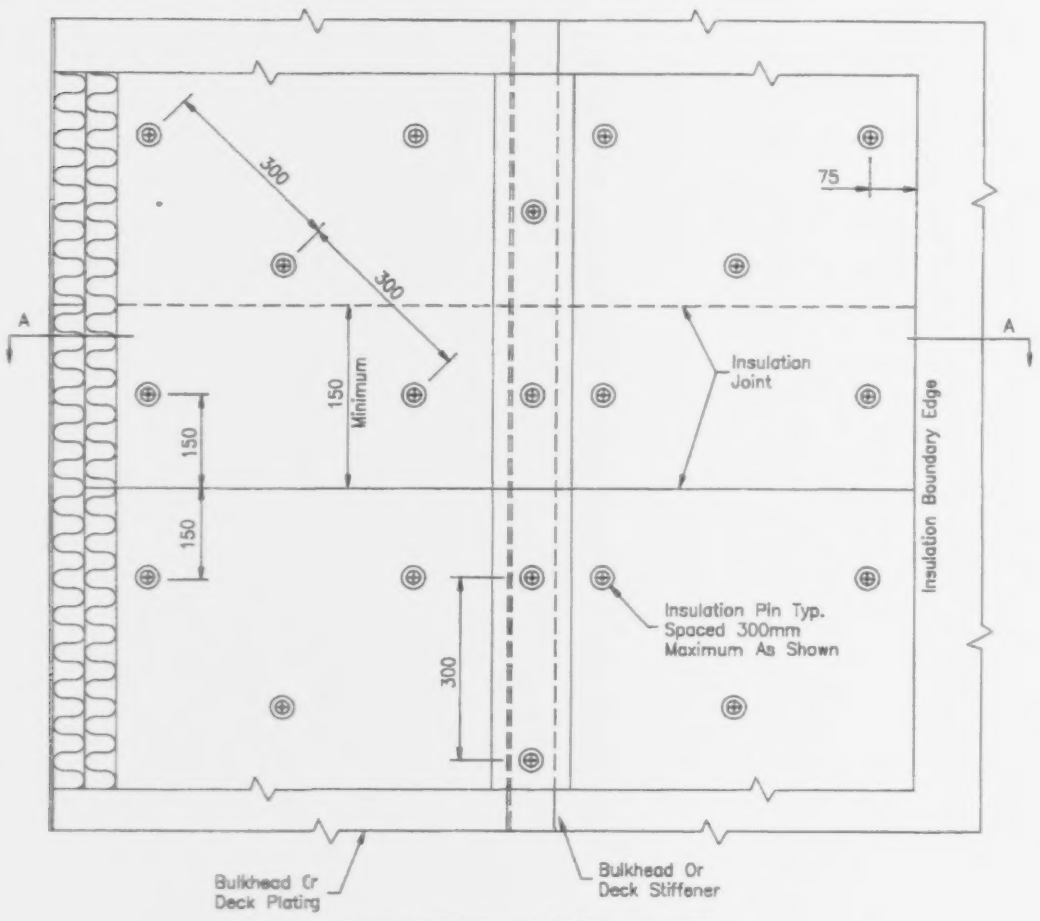

380 *
Deck Plating
'A' Class Fire Insulation Of The Same Or Higher Standard As The 'A' Class Deck
Bulkhead, Deckhouse Side Or Ships Side
Fire Insulation As Component Of 'A' Class Deck
'B' Class Ceiling Panel As Component Of 'A' Class Deck
3mm Thick Steel Stringer Plate Welded To Bulkhead, Deckhouse Side, Or Ships Side
Top Profile Of Lining Panel To Be Welded To Stringer Plate
Stiffener
Lining Panel

* Ribband Of Insulation To Be Fitted When "A" Is Less Than 380mm (450mm For Aluminum Structure)

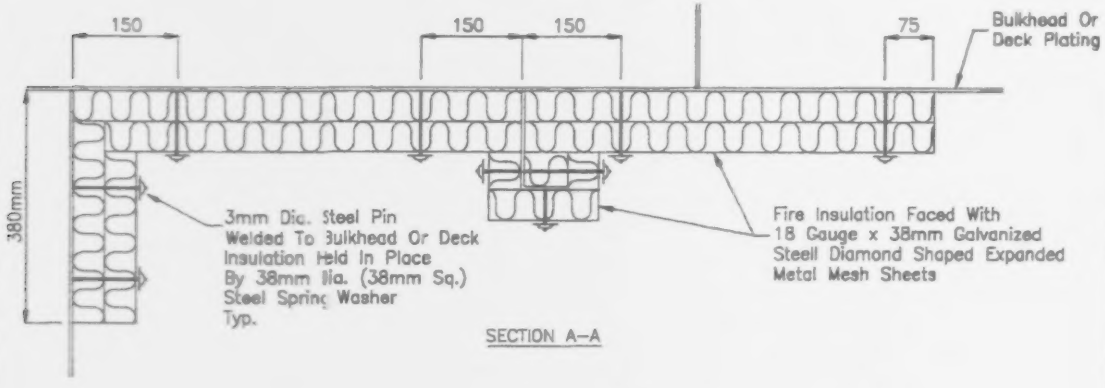
TERMINATION OF 'B' CLASS, 'C' CLASS, OR COMBUSTIBLE BULKHEAD OR LINING PANELS IN WAY OF 'A' CLASS CEILINGS

FIGURE 9

Ref. 4.2.7.3



PART ELEVATION OF BULKHEAD OR DECK

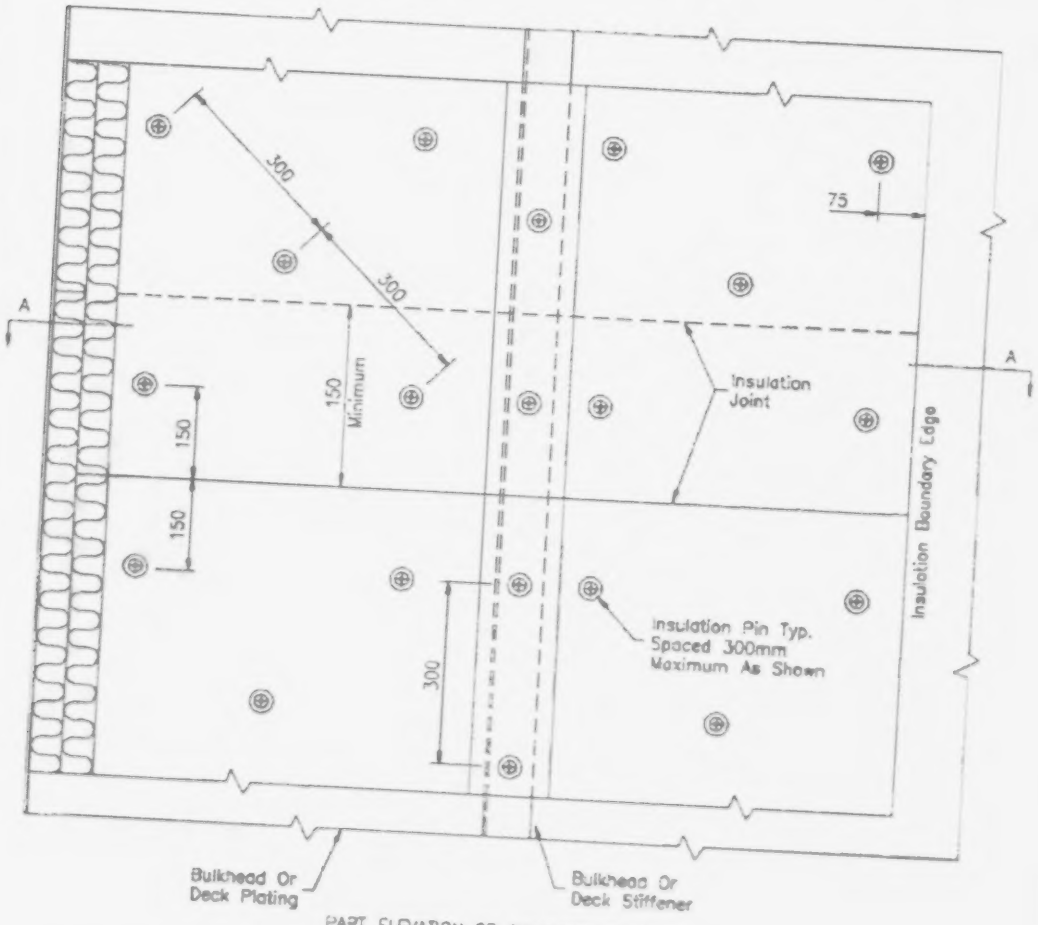


SECTION A–A

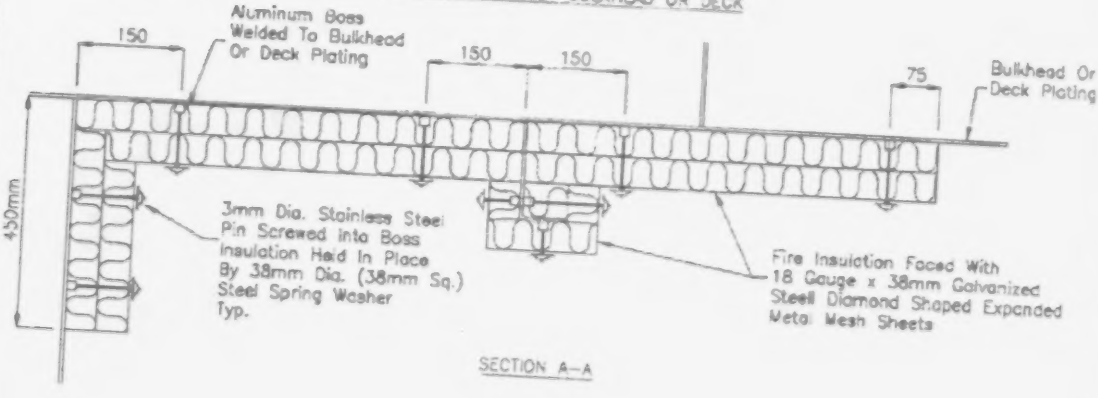
DETAILS OF ATTACHMENT OF MINERAL WOOL FIRE INSULATION TO A STEEL BULKHEAD OR DECK

FIGURE 10

Ref. 4.2.4.1



PART ELEVATION OF BULKHEAD OR DECK

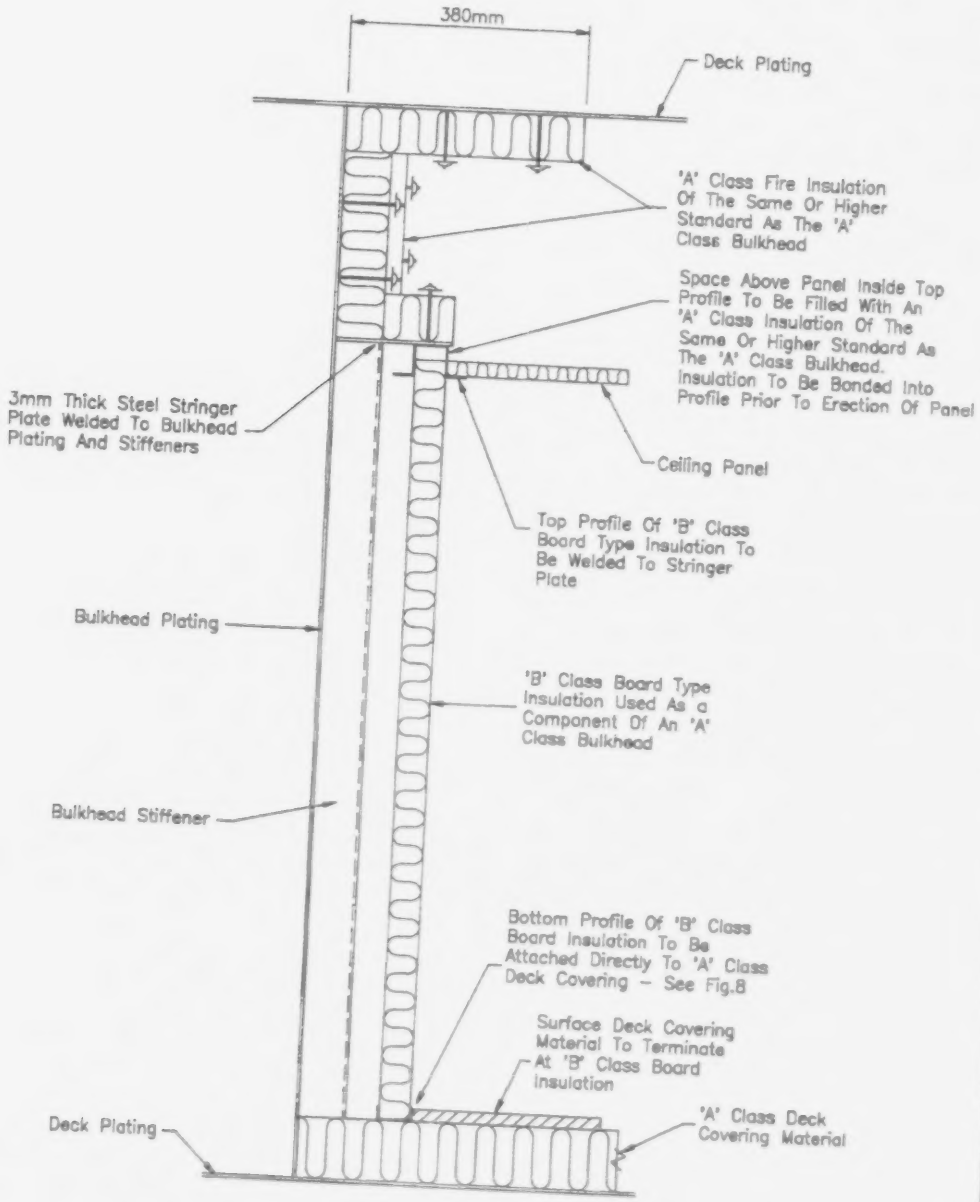


SECTION A–A

DETAILS OF ATTACHMENT OF MINERAL WOOL FIRE INSULATION TO AN ALUMINUM BULKHEAD OR DECK

FIGURE 11

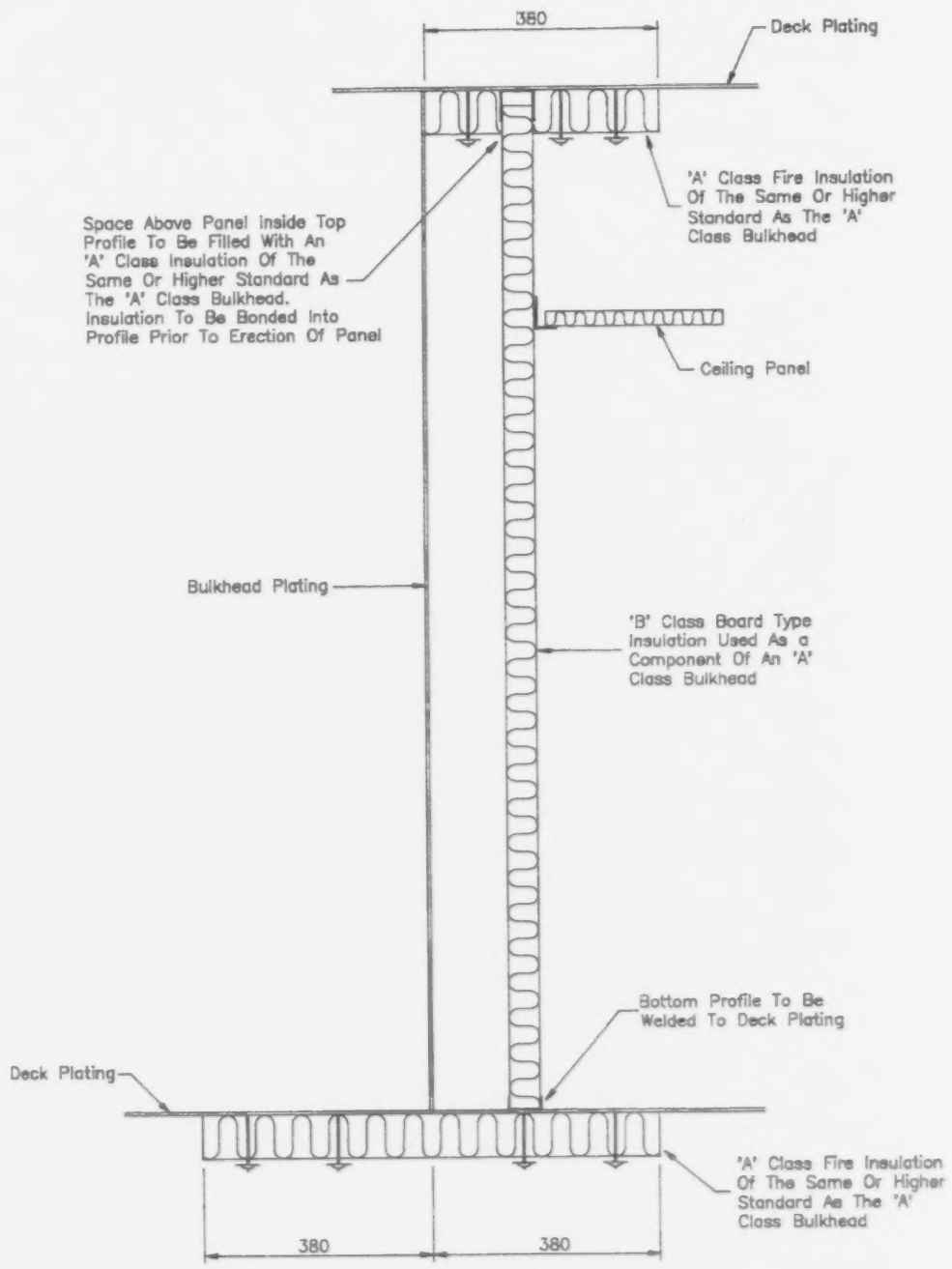
Ref. 4.2.4.1


380mm
Deck Plating
'A' Class Fire Insulation Of The Same Or Higher Standard As The 'A' Class Bulkhead
Space Above Panel Inside Top Profile To Be Filled With An 'A' Class Insulation Of The Same Or Higher Standard As The 'A' Class Bulkhead. Insulation To Be Bonded Into Profile Prior To Erection Of Panel
3mm Thick Steel Stringer Plate Welded To Bulkhead Plating And Stiffeners
Ceiling Panel
Top Profile Of 'B' Class Board Type Insulation To Be Welded To Stringer Plate
Bulkhead Plating
'B' Class Board Type Insulation Used As a Component Of An 'A' Class Bulkhead
Bulkhead Stiffener
Bottom Profile Of 'B' Class Board Insulation To Be Attached Directly To 'A' Class Deck Covering – See Fig.8
Surface Deck Covering Material To Terminate At 'B' Class Board Insulation
'A' Class Deck Covering Material
Deck Plating

ARRANGEMENT OF AN 'A' CLASS BULKHEAD USING A 'B' CLASS BOARD TYPE INSULATION AS A COMPONENT, WHEN THE BOARD TYPE INSULATION TERMINATES AT THE CEILING LEVEL

FIGURE 12

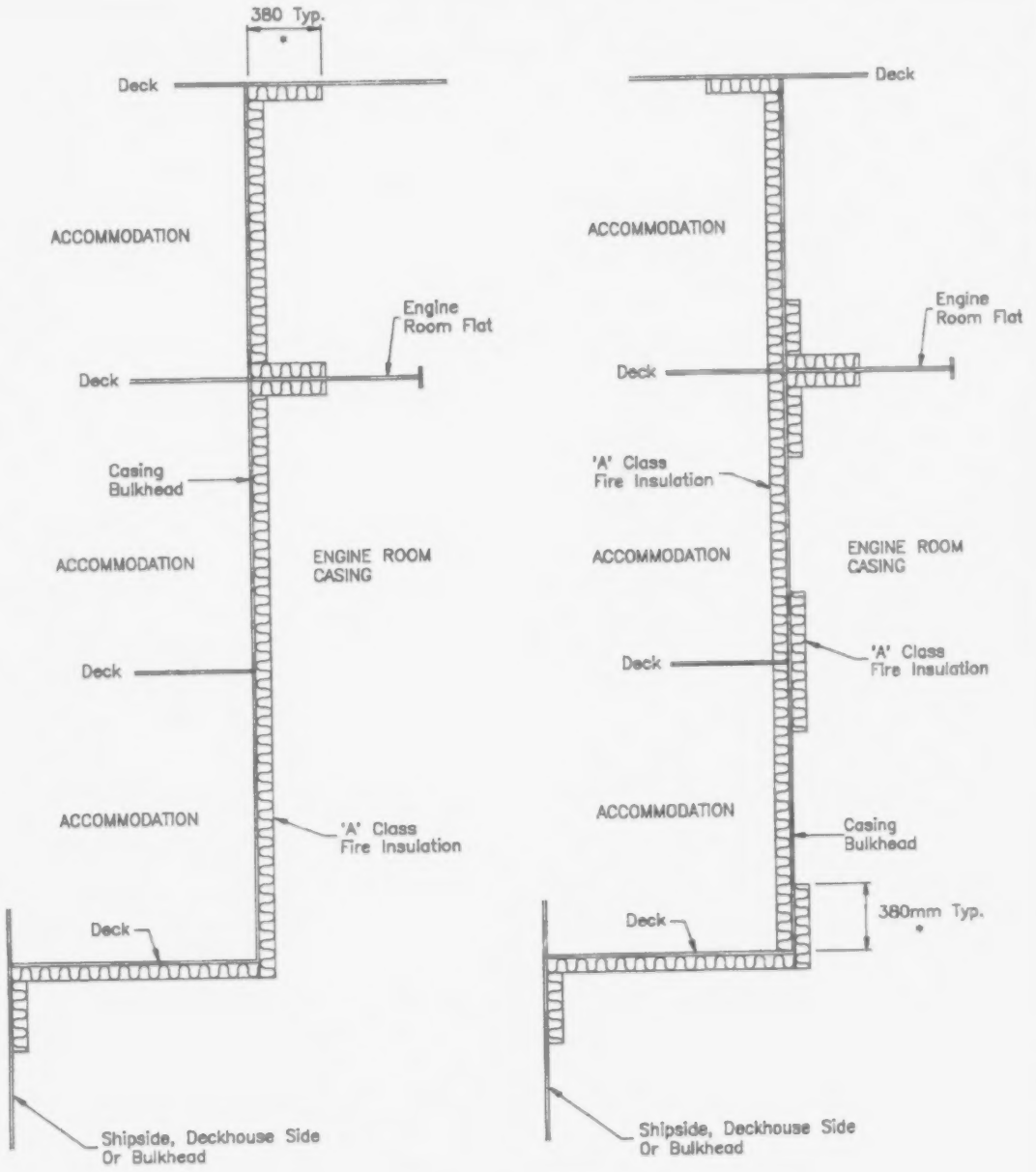
Ref. 4.2.5.3


380
Deck Plating
'A' Class Fire Insulation Of The Same Or Higher Standard As The 'A' Class Bulkhead
Space Above Panel Inside Top Profile To Be Filled With An 'A' Class Insulation Of The Same Or Higher Standard As The 'A' Class Bulkhead. Insulation To Be Bonded Into Profile Prior To Erection Of Panel
Ceiling Panel
Bulkhead Plating
'B' Class Board Type Insulation Used As a Component Of An 'A' Class Bulkhead
Bottom Profile To Be Welded To Deck Plating
Deck Plating
'A' Class Fire Insulation Of The Same Or Higher Standard As The 'A' Class Bulkhead
380
380

ARRANGEMENT OF AN 'A' CLASS BULKHEAD USING A 'B' CLASS BOARD TYPE INSULATION AS A COMPONENT, WHEN THE BOARD TYPE INSULATION EXTENDS FROM DECK TO DECK

FIGURE 13

Ref. 4.2.2.10



* 450mm For Aluminum Structure

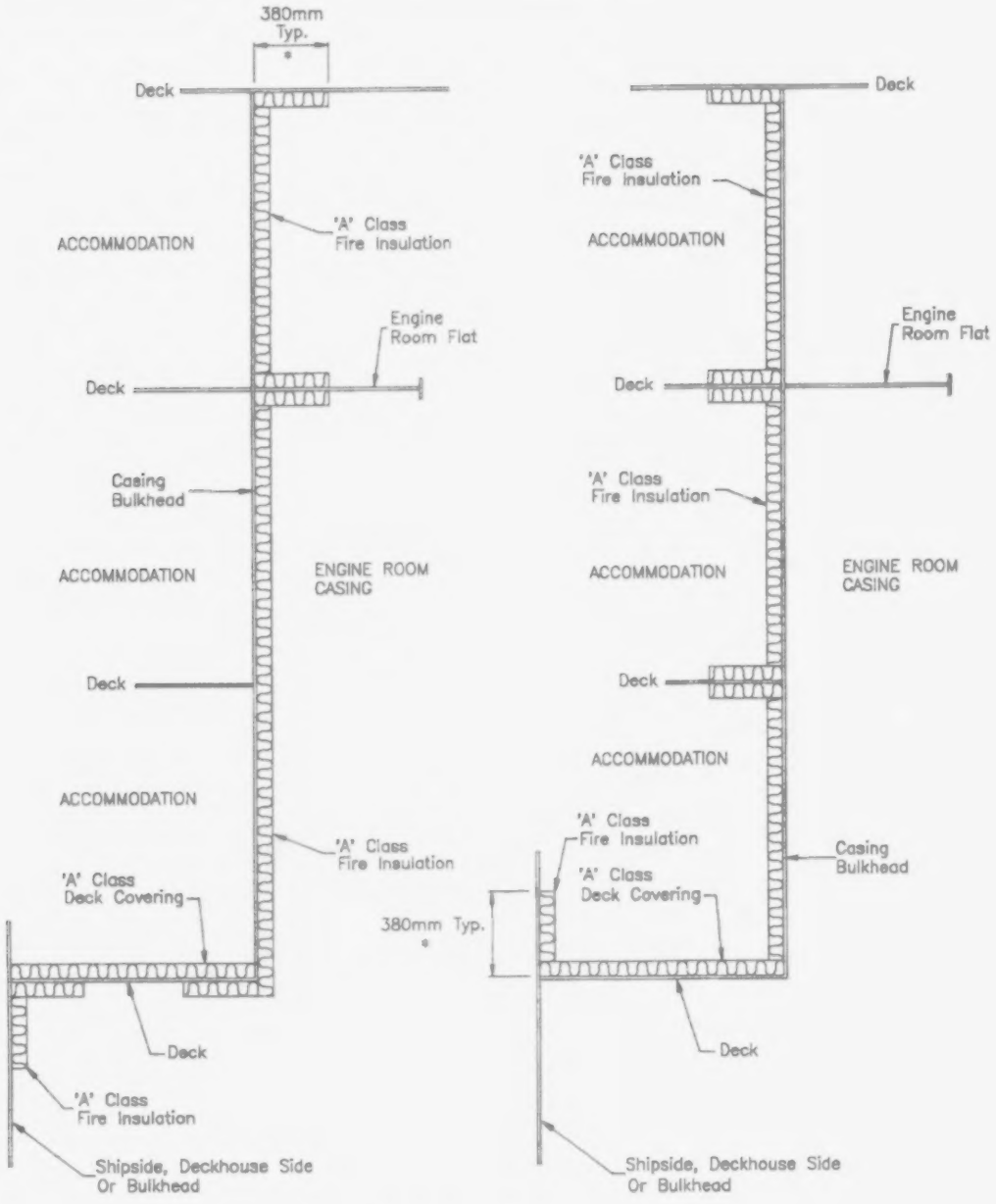
METHOD 1

METHOD 2

METHODS OF INSULATING A TYPICAL MACHINERY CASING SHOWING THE RIBANDS OF INSULATION AT BOUNDARIES AND INTERSECTIONS

FIGURE 14

Ref. 4.2.10.1



* 450mm For Aluminum Structure

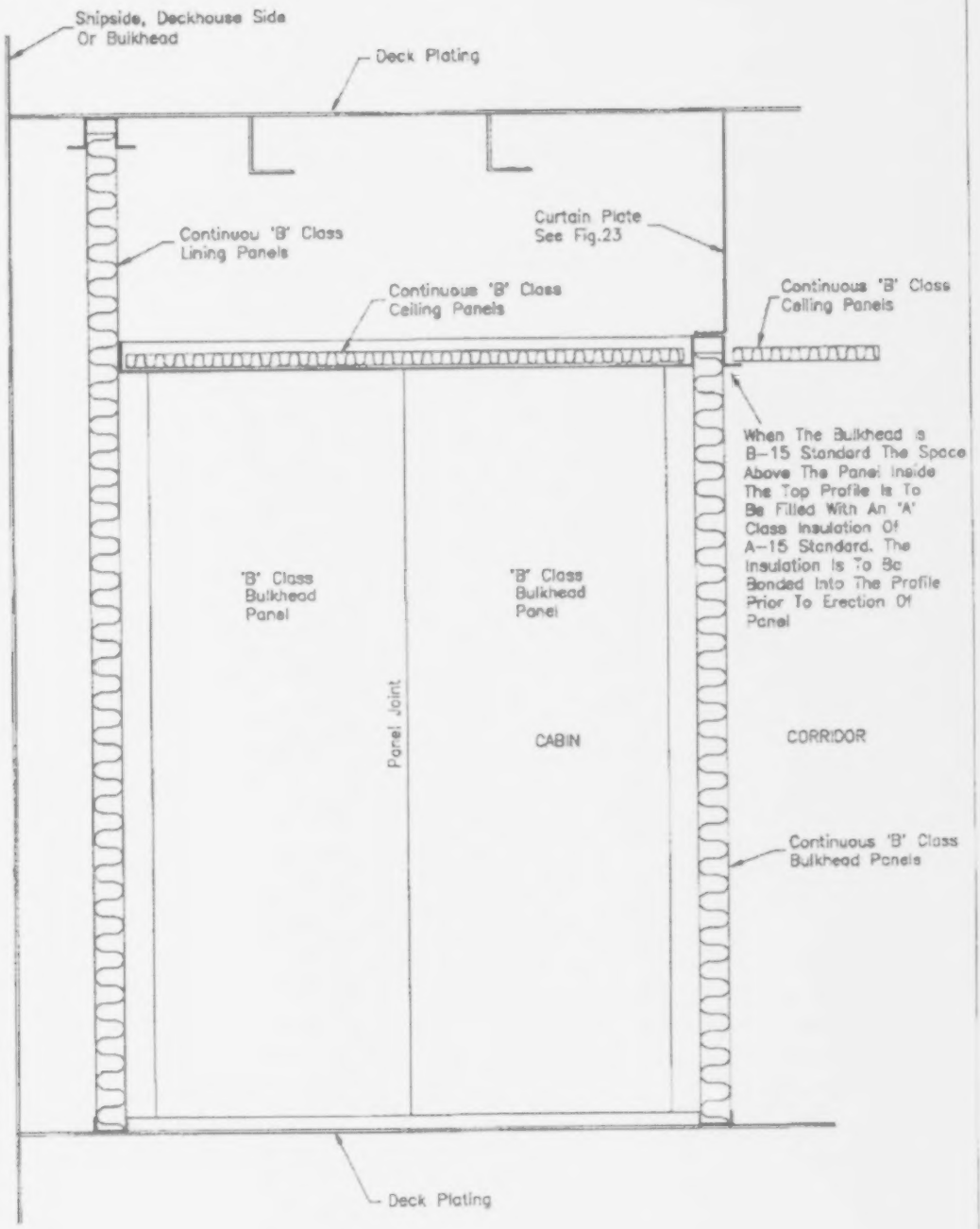
METHOD 3

METHOD 4

METHODS OF INSULATING A TYPICAL MACHINERY CASING SHOWING THE RIBANDS OF INSULATION AT BOUNDARIES AND INTERSECTIONS

FIGURE 15

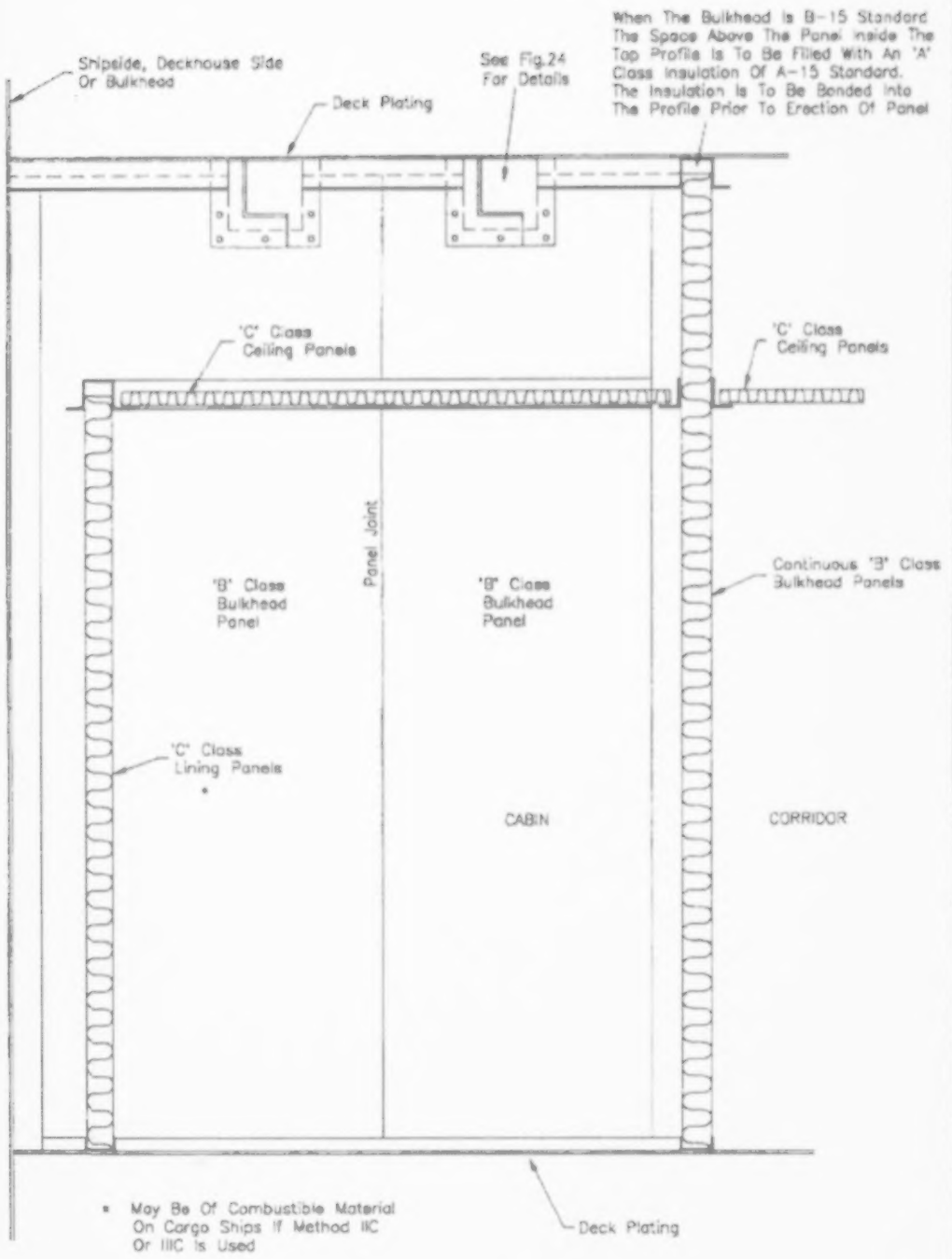
Fig. 4.2.10.1



ARRANGEMENT WHEN 'B' CLASS BULKHEADS DO NOT EXTEND DECK TO DECK OR TO THE SHELL OR DECKHOUSE SIDE

FIGURE 16

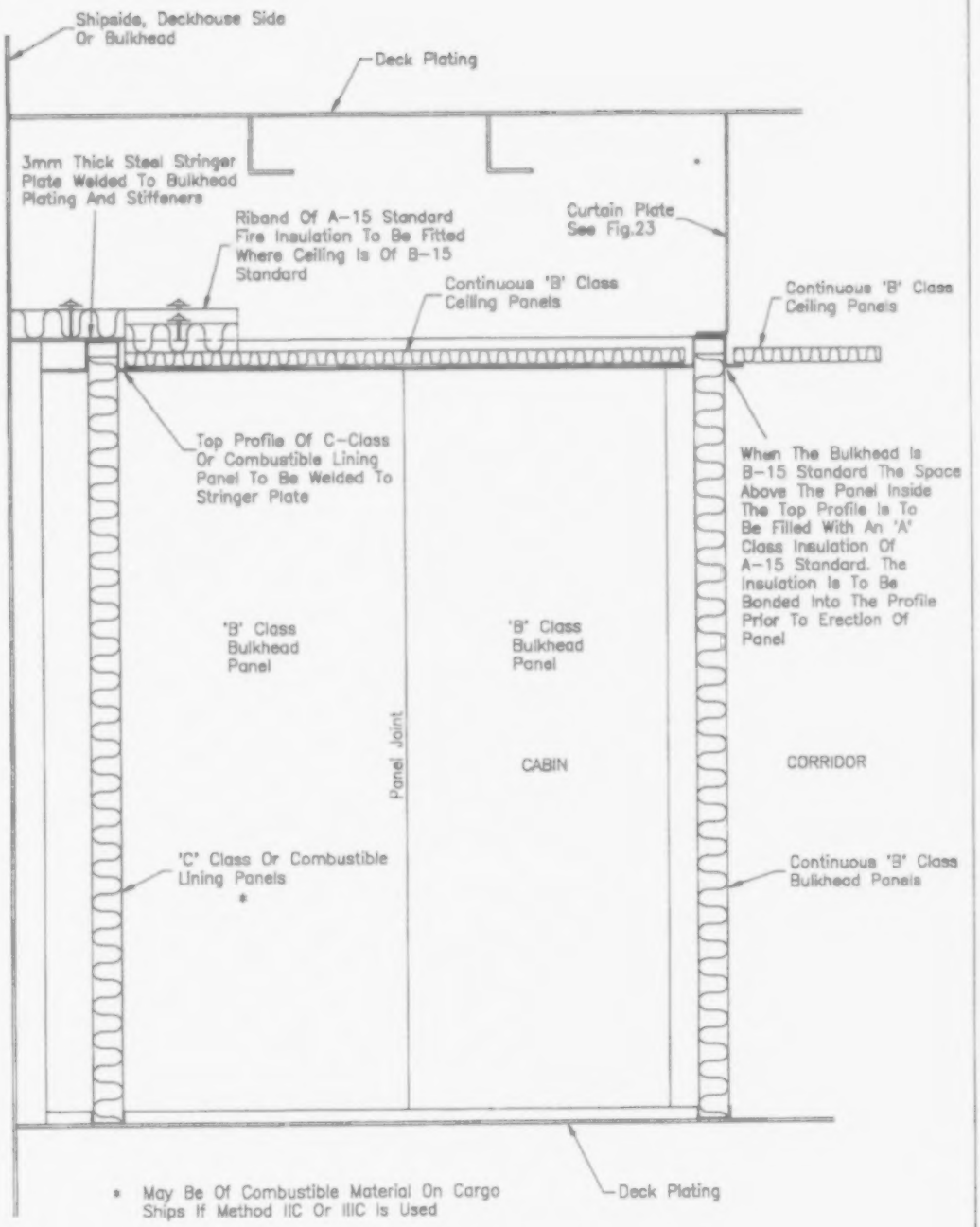
Ref. 4.4.1.2


When The Bulkhead Is B-15 Standard The Space Above The Panel Inside The Top Profile Is To Be Filled With An 'A' Class Insulation Of A-15 Standard. The Insulation Is To Be Bonded Into The Profile Prior To Erection Of Panel
Shipside, Deckhouse Side Or Bulkhead
Deck Plating
See Fig.24 For Details
'C' Class Ceiling Panels
'C' Class Ceiling Panels
Panel Joint
'B' Class Bulkhead Panel
'B' Class Bulkhead Panel
Continuous 'B' Class Bulkhead Panels
'C' Class Lining Panels *
CABIN
CORRIDOR
* May Be Of Combustible Material On Cargo Ships If Method IIC Or IIIC Is Used
Deck Plating

ARRANGEMENT WHEN 'B' CLASS BULKHEADS EXTEND DECK TO DECK AND TO THE SHELL OR DECKHOUSE SIDE

FIGURE 17

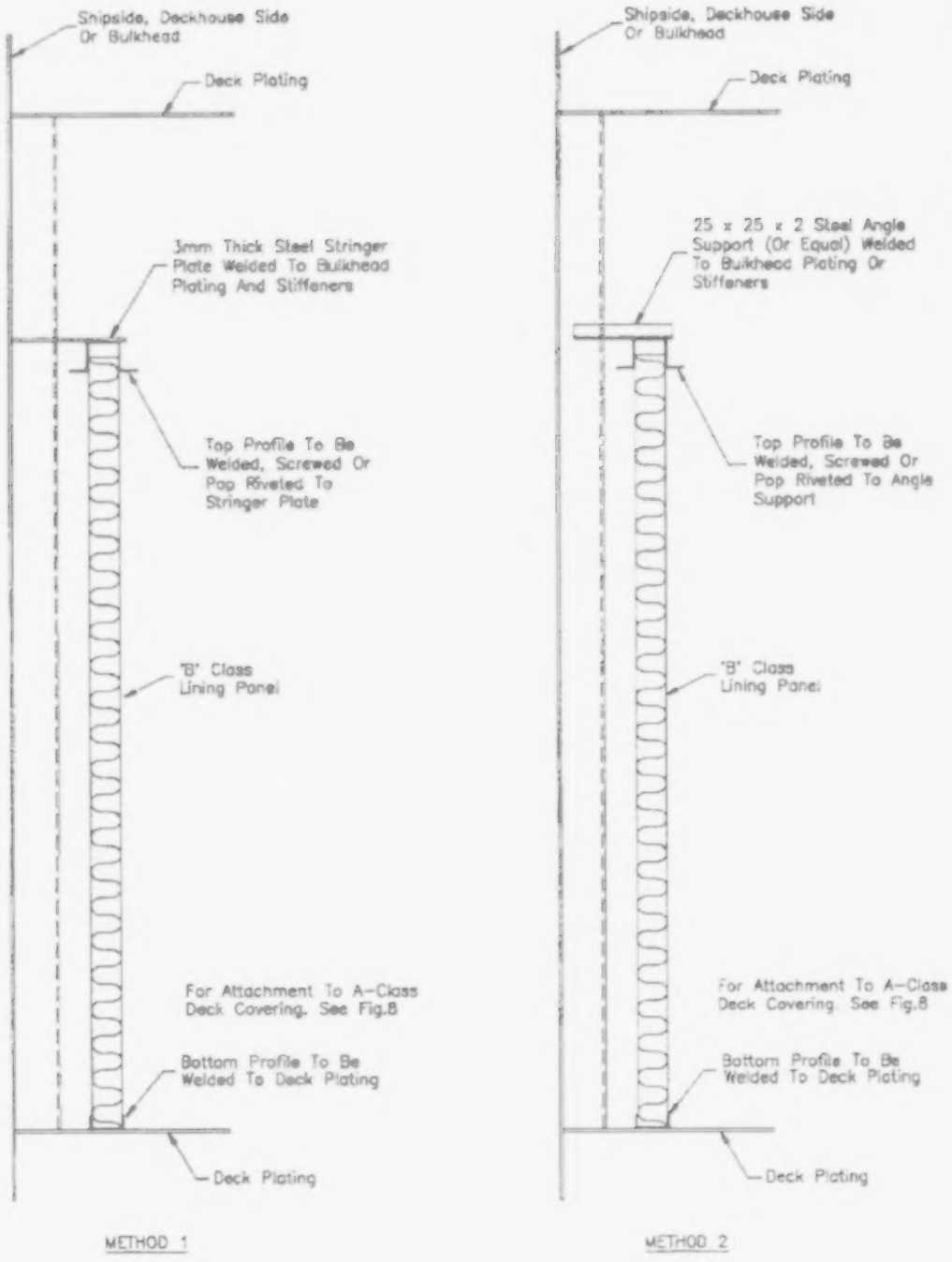
Ref. 4.4.1.2


Shipside, Deckhouse Side Or Bulkhead
Deck Plating
3mm Thick Steel Stringer Plate Welded To Bulkhead Plating And Stiffeners
Riband Of A-15 Standard Fire Insulation To Be Fitted Where Ceiling Is Of B-15 Standard
Curtain Plate See Fig.23
Continuous 'B' Class Ceiling Panels
Continuous 'B' Class Ceiling Panels
Top Profile Of C-Class Or Combustible Lining Panel To Be Welded To Stringer Plate
When The Bulkhead Is B-15 Standard The Space Above The Panel Inside The Top Profile Is To Be Filled With An 'A' Class Insulation Of A-15 Standard. The Insulation Is To Be Bonded Into The Profile Prior To Erection Of Panel
'B' Class Bulkhead Panel
'B' Class Bulkhead Panel
Panel Joint
CABIN
CORRIDOR
'C' Class Or Combustible Lining Panels *
Continuous 'B' Class Bulkhead Panels
Deck Plating
* May Be Of Combustible Material On Cargo Ships If Method IIC Or IIIC Is Used

ARRANGEMENT WHEN 'B' CLASS BULKHEADS DO NOT EXTEND DECK TO DECK BUT DO EXTEND TO THE SHELL OR DECHOUSE SIDE

FIGURE 18

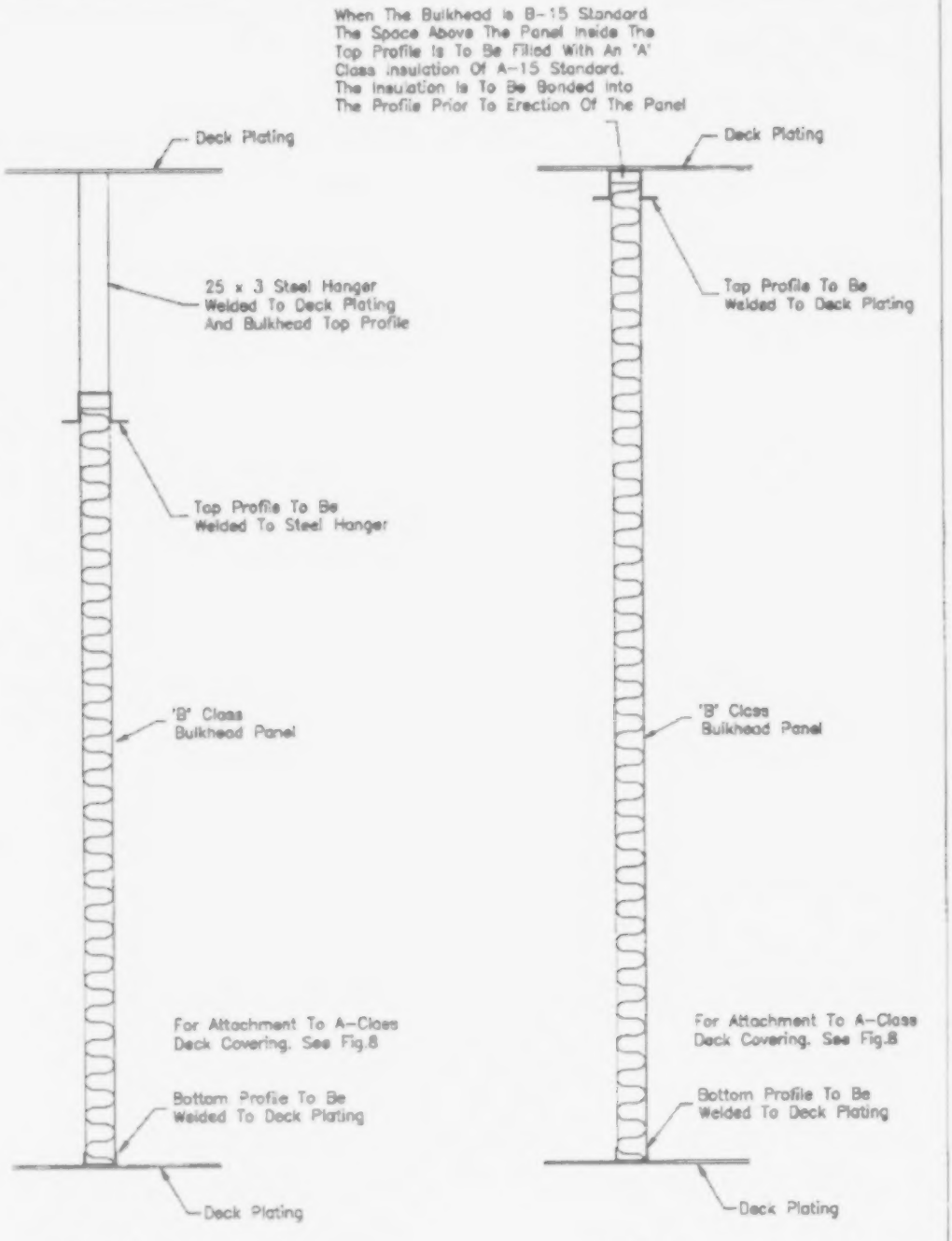
Ref. 4.4.1.2


Shipside, Deckhouse Side Or Bulkhead
Deck Plating
3mm Thick Steel Stringer Plate Welded To Bulkhead Plating And Stiffeners
Top Profile To Be Welded, Screwed Or Pop Riveted To Stringer Plate
'B' Class Lining Panel
For Attachment To A-Class Deck Covering. See Fig.8
Bottom Profile To Be Welded To Deck Plating
Deck Plating
METHOD 1
Shipside, Deckhouse Side Or Bulkhead
Deck Plating
25 x 25 x 2 Steel Angle Support (Or Equal) Welded To Bulkhead Plating Or Stiffeners
Top Profile To Be Welded, Screwed Or Pop Riveted To Angle Support
'B' Class Lining Panel
For Attachment To A-Class Deck Covering. See Fig.8
Bottom Profile To Be Welded To Deck Plating
Deck Plating
METHOD 2

ATTACHMENT OF A 'B' CLASS LINING PANEL TO THE SHIP'S STRUCTURE

FIGURE 19

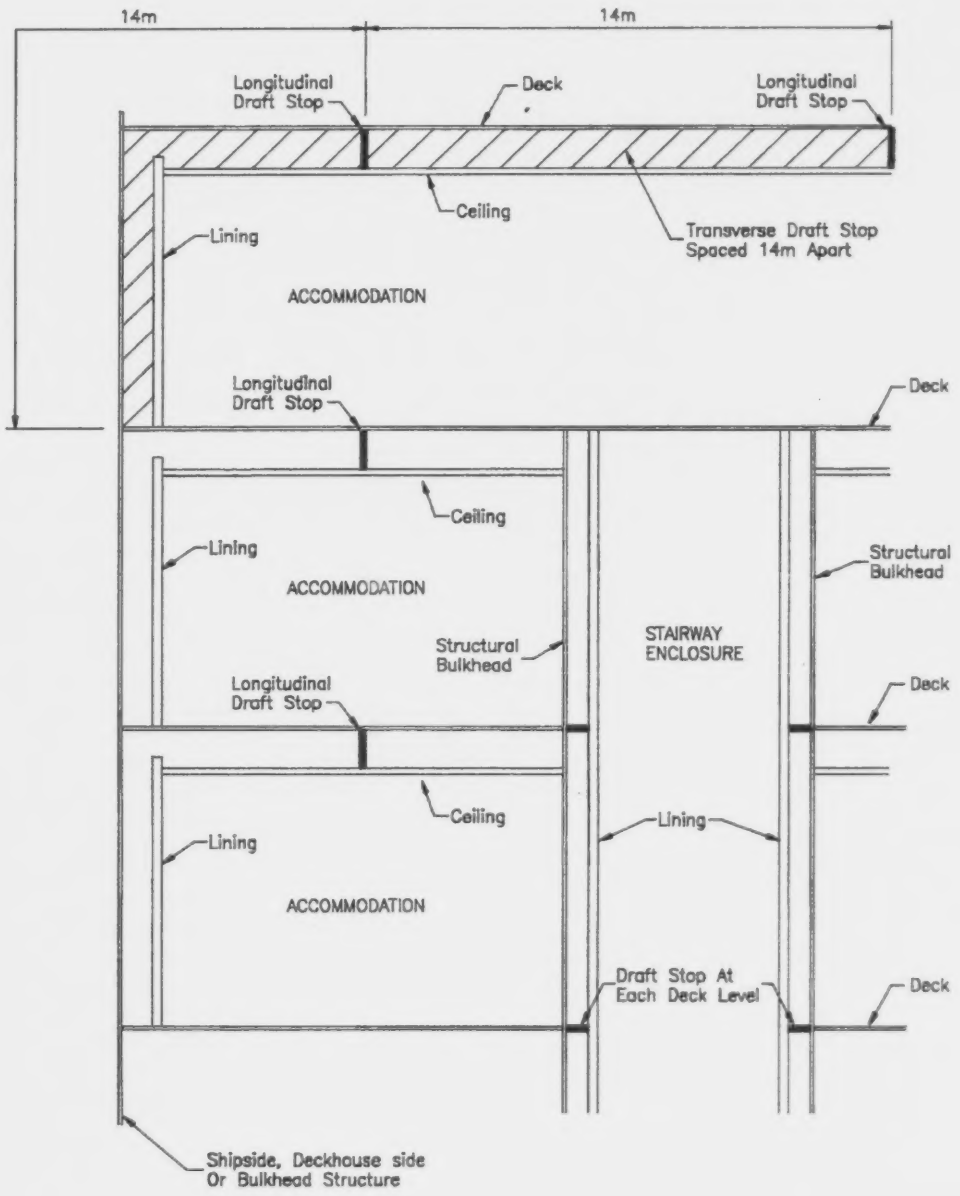
Ref. 4.4.5.5


When The Bulkhead Is B-15 Standard
The Space Above The Panel Inside The
Top Profile Is To Be Filled With An 'A'
Class Insulation Of A-15 Standard.
The Insulation Is To Be Bonded Into
The Profile Prior To Erection Of The Panel
Deck Plating
25 x 3 Steel Hanger
Welded To Deck Plating
And Bulkhead Top Profile
Top Profile To Be
Welded To Steel Hanger
'B' Class
Bulkhead Panel
For Attachment To A-Class
Deck Covering. See Fig.8
Bottom Profile To Be
Welded To Deck Plating
Deck Plating
METHOD 1
Deck Plating
Top Profile To Be
Welded To Deck Plating
'B' Class
Bulkhead Panel
For Attachment To A-Class
Deck Covering. See Fig.8
Bottom Profile To Be
Welded To Deck Plating
Deck Plating
METHOD 2

ATTACHMENT OF A 'B' CLASS BULKHEAD PANEL
TO THE DECK STRUCTURE

FIGURE 20

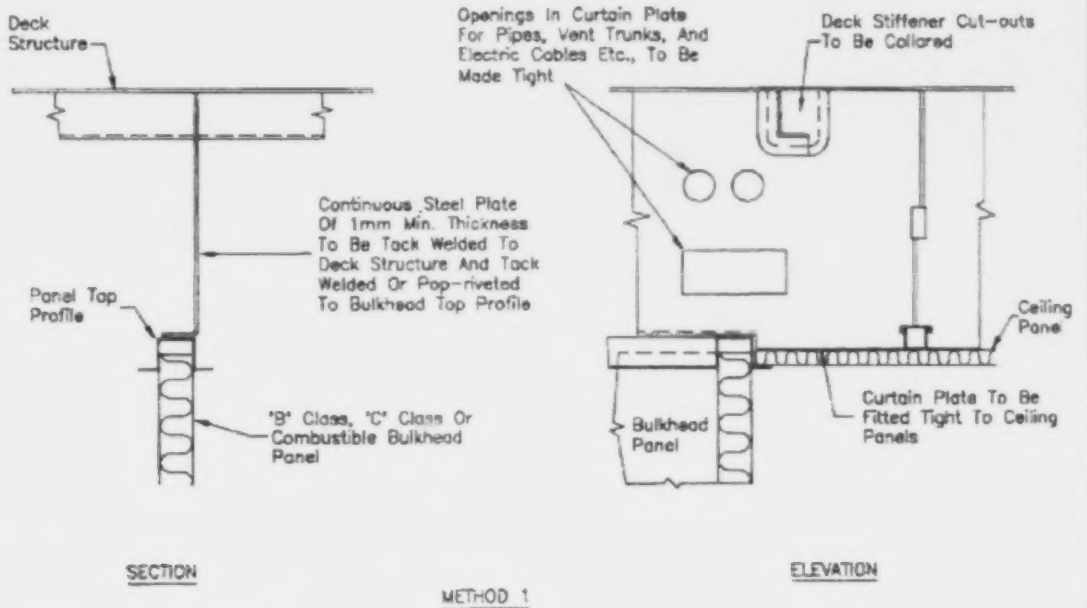
Ref. 4.4.6.5



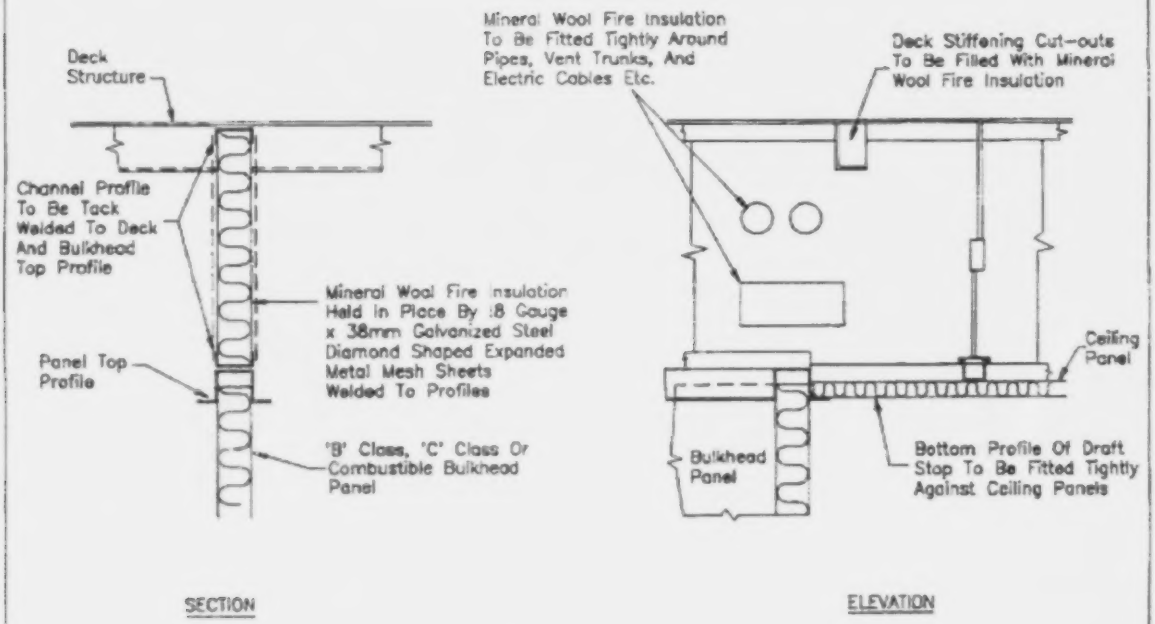
TYPICAL ARRANGEMENT OF DRAFT STOPS

FIGURE 21

Ref. 4.5.1


Deck Structure
Continuous Steel Plate Of 1mm Min. Thickness To Be Tack Welded To Deck Structure And Tack Welded Or Pop-riveted To Bulkhead Top Profile
Panel Top Profile
'B' Class, 'C' Class Or Combustible Bulkhead Panel
SECTION
Openings In Curtain Plate For Pipes, Vent Trunks, And Electric Cables Etc., To Be Made Tight
Deck Stiffener Cut-outs To Be Collared
Ceiling Pane
Curtain Plate To Be Fitted Tight To Ceiling Panels
Bulkhead Panel
ELEVATION

METHOD 1

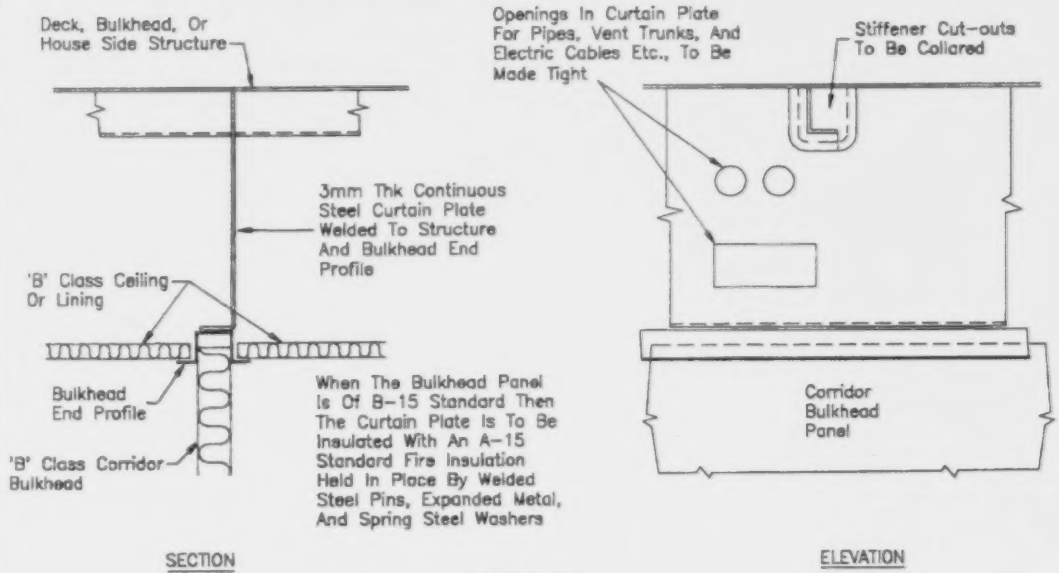

Deck Structure
Channel Profile To Be Tack Welded To Deck And Bulkhead Top Profile
Mineral Wool Fire Insulation Held In Place By 18 Gauge x 38mm Galvanized Steel Diamond Shaped Expanded Metal Mesh Sheets Welded To Profiles
Panel Top Profile
'B' Class, 'C' Class Or Combustible Bulkhead Panel
SECTION
Mineral Wool Fire Insulation To Be Fitted Tightly Around Pipes, Vent Trunks, And Electric Cables Etc.
Deck Stiffening Cut-outs To Be Filled With Mineral Wool Fire Insulation
Ceiling Panel
Bulkhead Panel
Bottom Profile Of Draft Stop To Be Fitted Tightly Against Ceiling Panels
ELEVATION

METHOD 2

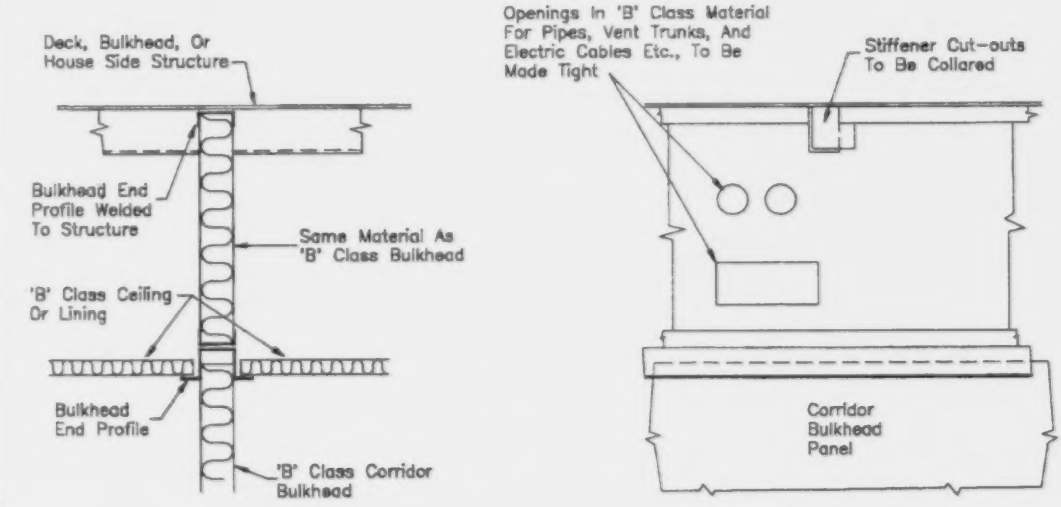
TYPICAL DRAFT STOP DETAILS

FIGURE 22

Ref. 4.5.3



METHOD 1

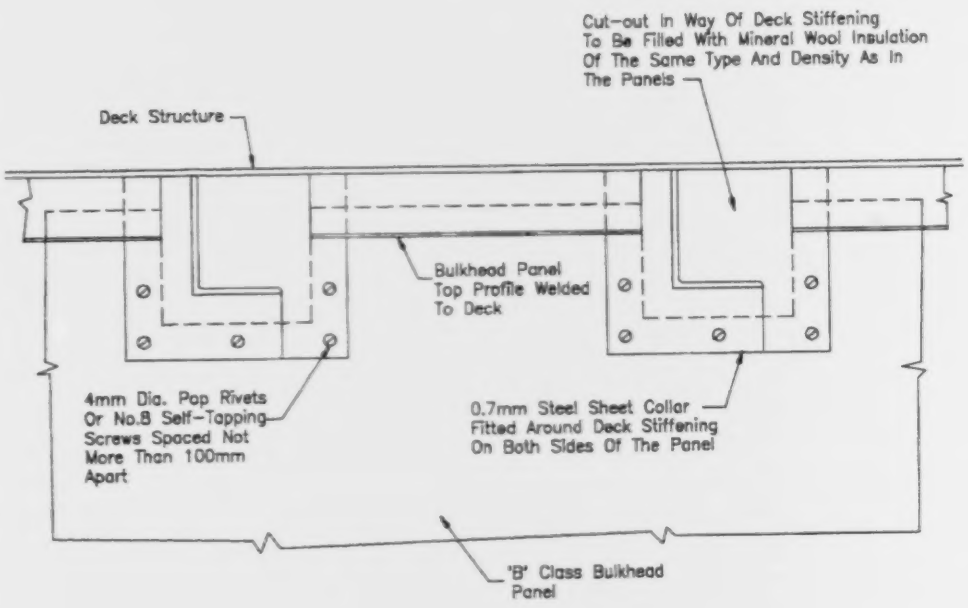


METHOD 2

CONSTRUCTION OF CORRIDOR BULKHEADS
IN PASSENGER SHIPS

FIGURE 23

Ref. 4.4.1.2

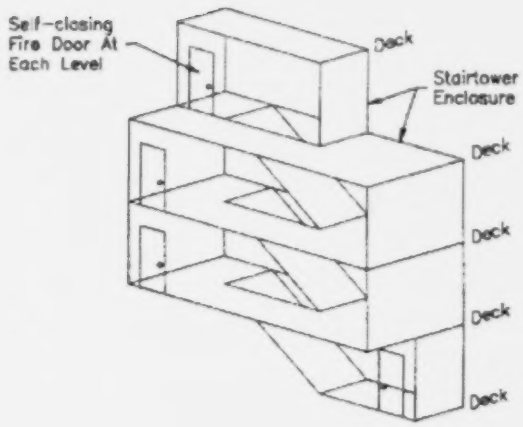


ARRANGEMENT AT TOP OF B-CLASS BULKHEAD AND LINING PANELS WHEN PANELS ARE FITTED DECK TO DECK

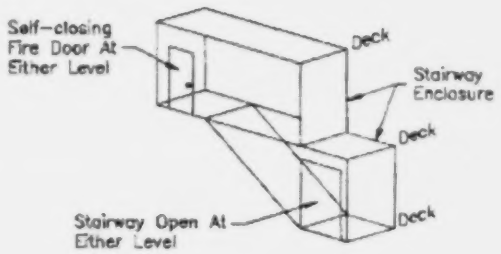
FIGURE 24

Ref. 4.4.1.5

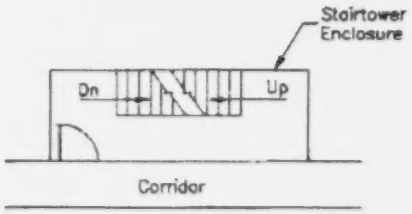
Stairs Are Completely Enclosed
A Person May Enter The Enclosure
At Any Level And Proceed To Any
Other Leve Without Leaving The
Enclosure



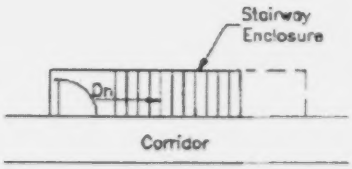
ISOMETRIC VIEW OF STAIRTOWER



ISOMETRIC VIEW OF STAIRWAY



PLAN VIEW



PLAN VIEW

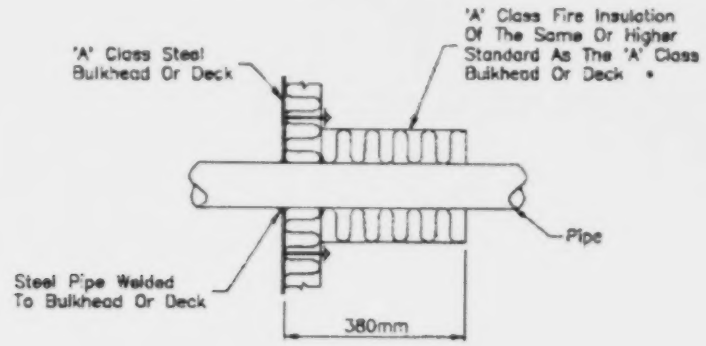
STAIRTOWER

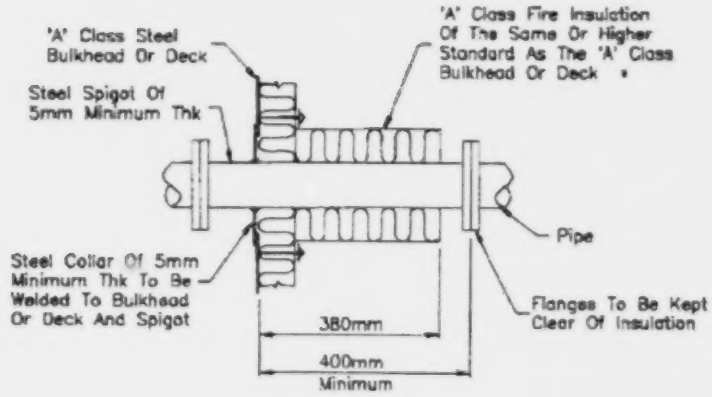
STAIRWAY

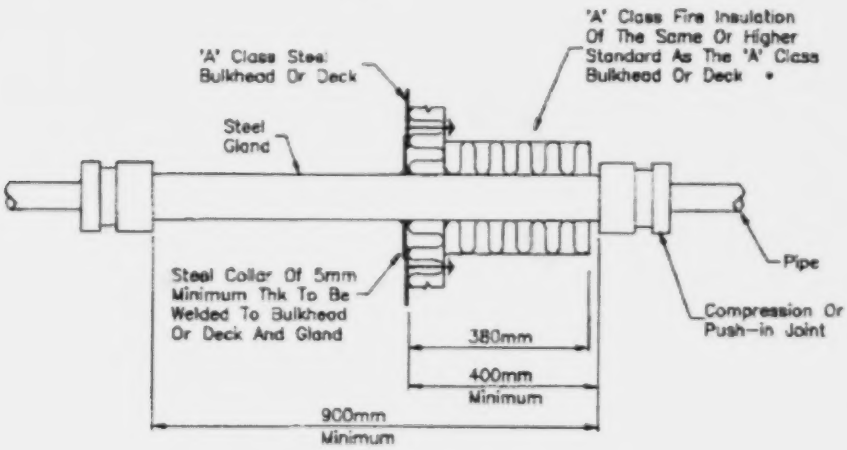
TYPICAL ARRANGEMENT OF STAIRTOWERS AND STAIRWAYS

FIGURE 25

Ref. 4.12.5.2 & 4.12.5.3





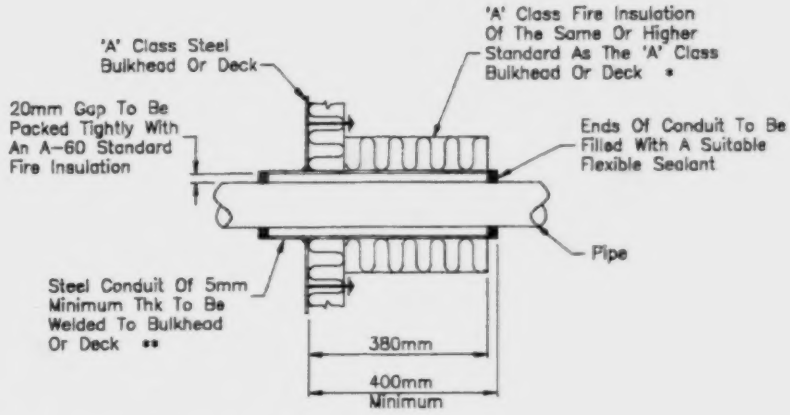


* Where Pipes Pass Through A-0 Standard Bulkheads Or Decks The Insulation Is Not Required

ACCEPTABLE NON-MANUFACTURED SYSTEMS FOR PIPES OF STEEL OR ANY OTHER MATERIAL HAVING A MELTING POINT OF 1000° C OR MORE PENETRATING 'A' CLASS BULKHEADS OR DECKS

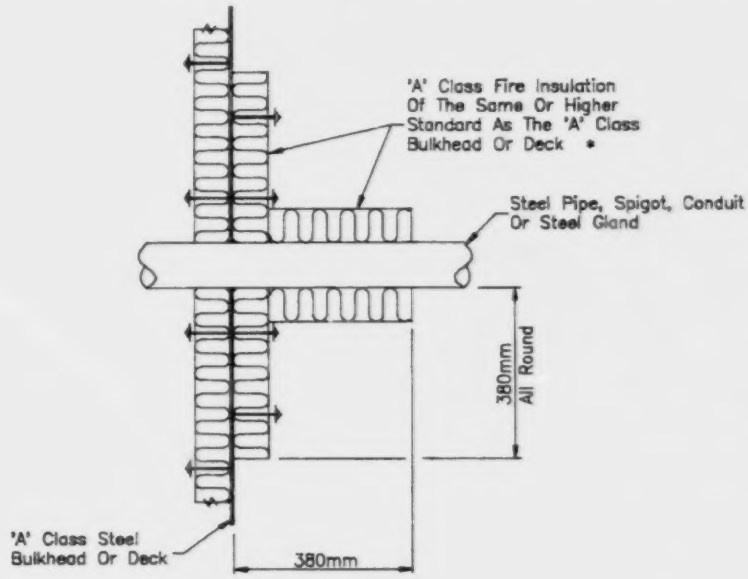
FIGURE 26

Ref. 4.2.12.1



** Length Of Conduit To Be As Indicated In 4.2.12.1(b)

* Where Pipes Pass Through A-0 Standard Bulkheads Or Decks The Insulation Is Not Required

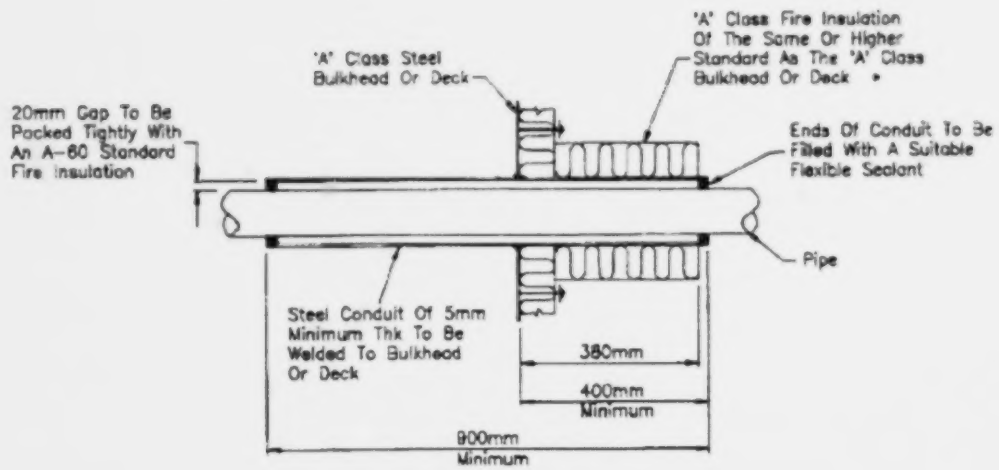


TYPICAL DETAIL SHOWING INSULATION OF PENETRATION WHEN AN 'A' CLASS BULKHEAD OR DECK IS INSULATED ON THE OPPOSITE SIDE

ACCEPTABLE NON-MANUFACTURED SYSTEMS FOR PIPES OF STEEL OR ANY OTHER MATERIAL HAVING A MELTING POINT OF 1000° C OR MORE PENETRATING 'A' CLASS BULKHEADS OR DECKS

FIGURE 27

Ref. 4.2.12.1

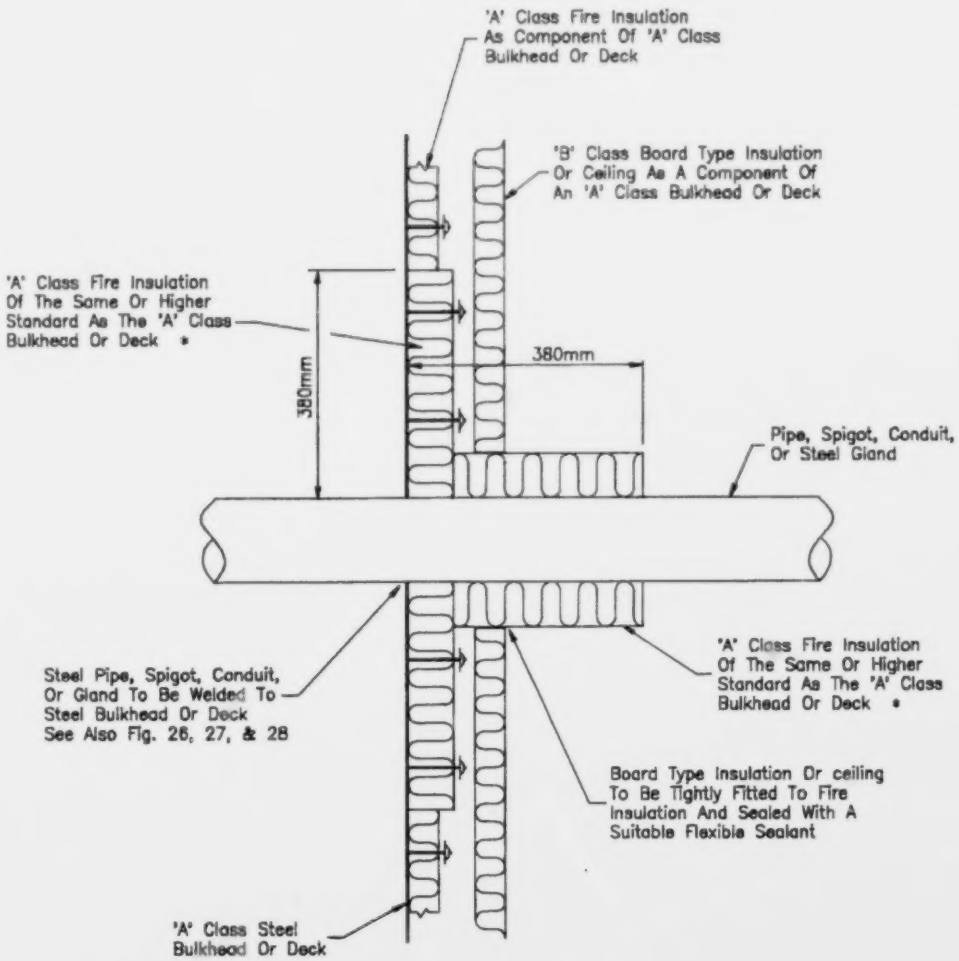


• Where Pipes Pass Through A-0 Standard Bulkheads Or Decks The Insulation Is Not Required

ACCEPTABLE NON-MANUFACTURED SYSTEMS FOR PIPES OF A MATERIAL HAVING A MELTING POINT OF LESS THAN 1000° C PENETRATING 'A' CLASS BULKHEADS OR DECKS

FIGURE 28

Ref. 4.2.12.2

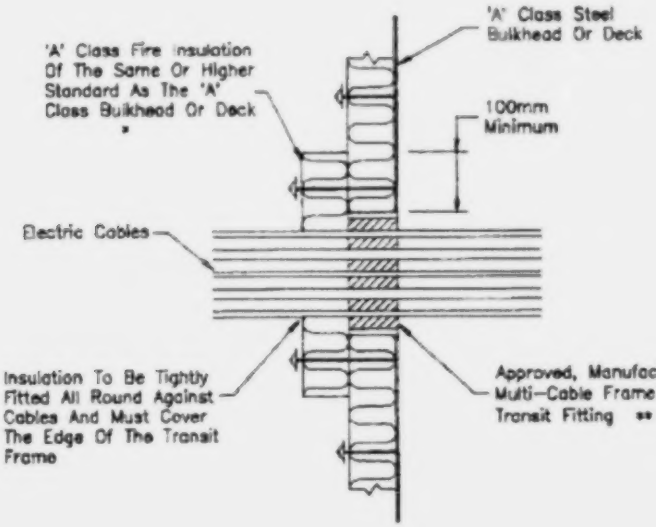

'A' Class Fire Insulation
As Component Of 'A' Class
Bulkhead Or Deck
'B' Class Board Type Insulation
Or Ceiling As A Component Of
An 'A' Class Bulkhead Or Deck
'A' Class Fire Insulation
Of The Same Or Higher
Standard As The 'A' Class
Bulkhead Or Deck *
380mm
380mm
Pipe, Spigot, Conduit,
Or Steel Gland
Steel Pipe, Spigot, Conduit,
Or Gland To Be Welded To
Steel Bulkhead Or Deck
See Also Fig. 26, 27, & 28
'A' Class Fire Insulation
Of The Same Or Higher
Standard As The 'A' Class
Bulkhead Or Deck *
Board Type Insulation Or ceiling
To Be Tightly Fitted To Fire
Insulation And Sealed With A
Suitable Flexible Sealant
'A' Class Steel
Bulkhead Or Deck

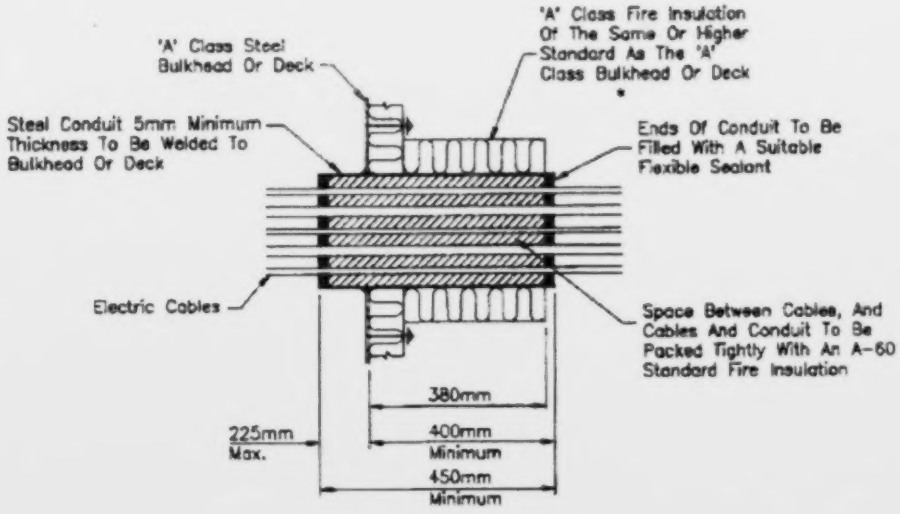
* Where Pipes Pass Through A-0 Standard Bulkheads Or Decks The Insulation Is Not Required

ACCEPTABLE NON-MANUFACTURED SYSTEMS FOR PIPES OF STEEL OR ANY OTHER MATERIAL HAVING A MELTING POINT OF 1000° C OR MORE PENETRATING 'A' CLASS BULKHEADS OR DECKS

FIGURE 29

Ref. 4.2.14.2


'A' Class Steel Bulkhead Or Deck
'A' Class Fire Insulation Of The Same Or Higher Standard As The 'A' Class Bulkhead Or Deck *
100mm Minimum
Electric Cables
Insulation To Be Tightly Fitted All Round Against Cables And Must Cover The Edge Of The Transit Frame
Approved, Manufactured Multi-Cable Frame Type Transit Fitting **


'A' Class Steel Bulkhead Or Deck
'A' Class Fire Insulation Of The Same Or Higher Standard As The 'A' Class Bulkhead Or Deck *
Steel Conduit 5mm Minimum Thickness To Be Welded To Bulkhead Or Deck
Ends Of Conduit To Be Filled With A Suitable Flexible Sealant
Electric Cables
Space Between Cables, And Cables And Conduit To Be Packed Tightly With An A-60 Standard Fire Insulation
380mm
225mm Max.
400mm Minimum
450mm Minimum

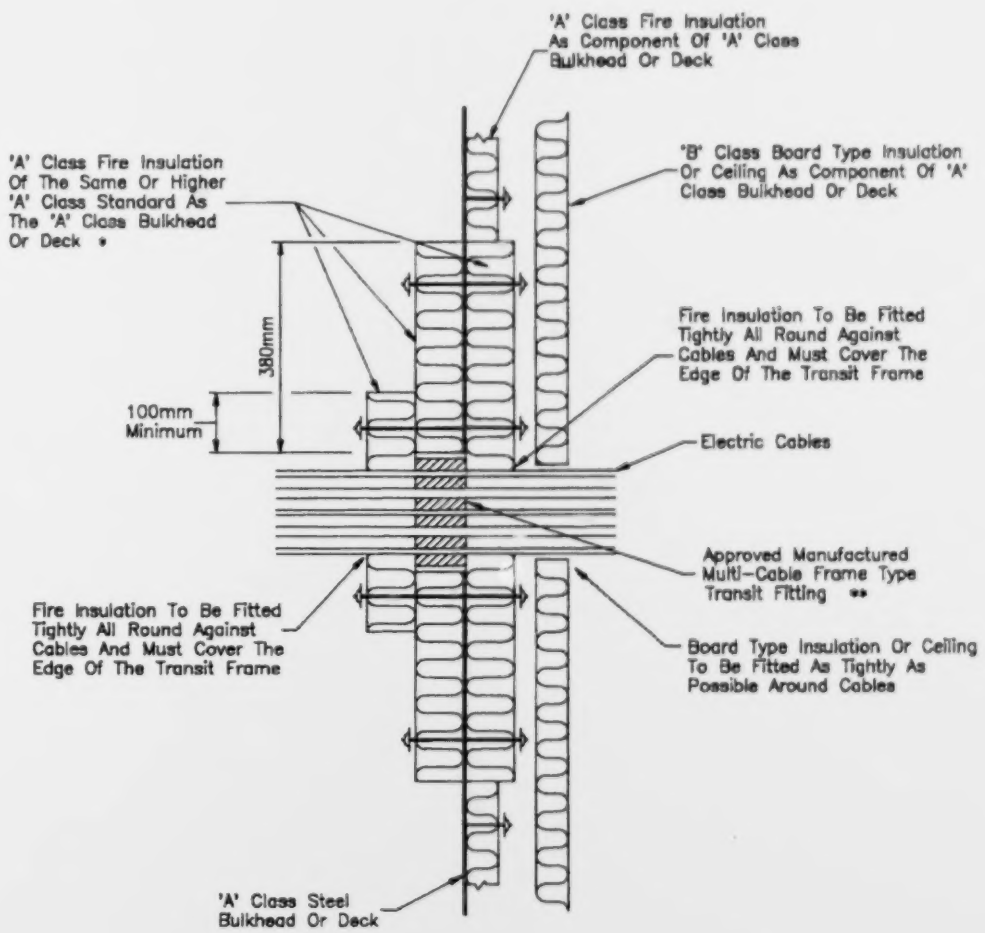
* Where Cables Pass Through A-0 Standard Bulkheads Or Decks The Insulation Is Not Required

** Detailed Insulation Requirements For Individual Cable Transits Are Specified On The Relevant Certificate Of Approval

PENETRATION OF 'A' CLASS BULKHEADS OR DECKS BY ELECTRIC CABLES

FIGURE 30

Ref. 4.2.15.1 & 4.2.15.2


'A' Class Fire Insulation As Component Of 'A' Class Bulkhead Or Deck
'A' Class Fire Insulation Of The Same Or Higher 'A' Class Standard As The 'A' Class Bulkhead Or Deck *
'B' Class Board Type Insulation Or Ceiling As Component Of 'A' Class Bulkhead Or Deck
380mm
100mm Minimum
Fire Insulation To Be Fitted Tightly All Round Against Cables And Must Cover The Edge Of The Transit Frame
Electric Cables
Approved Manufactured Multi-Cable Frame Type Transit Fitting **
Fire Insulation To Be Fitted Tightly All Round Against Cables And Must Cover The Edge Of The Transit Frame
Board Type Insulation Or Ceiling To Be Fitted As Tightly As Possible Around Cables
'A' Class Steel Bulkhead Or Deck

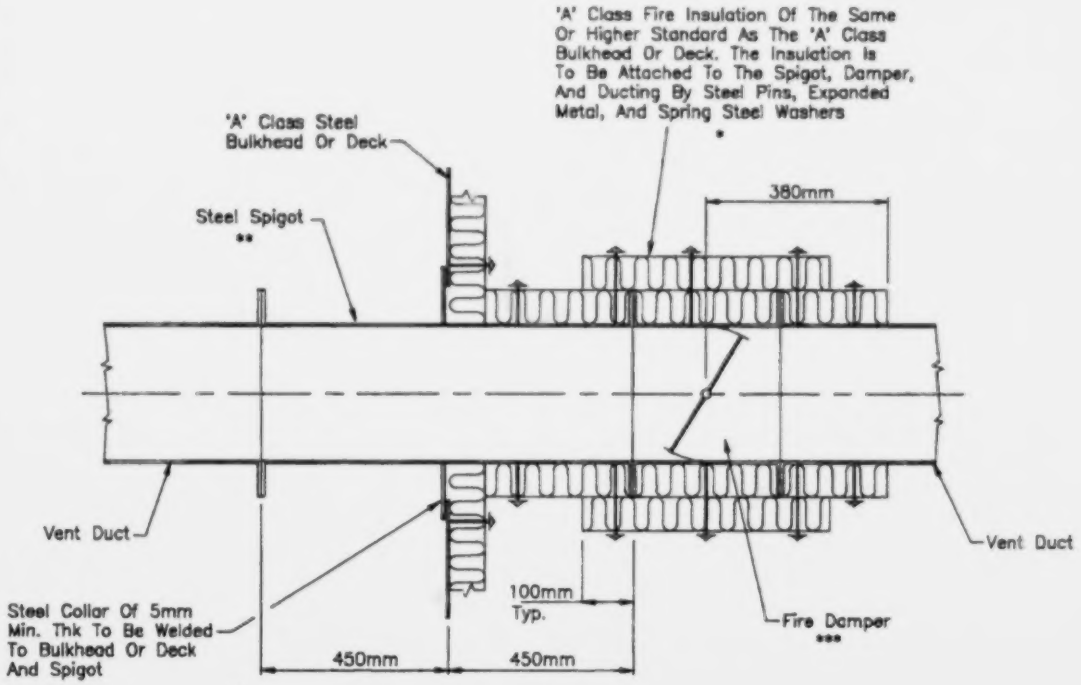
* Where Cables Pass Through A-0 Standard Bulkheads Or Decks The Insulation Is Not Required

** Detailed Installation Requirements For Individual Cable Transits Are Specified On The Relevant Certificate Of Approval

PENETRATION OF 'A' CLASS BULKHEADS OR DECKS BY ELECTRIC CABLES WHEN A 'B' CLASS BOARD TYPE INSULATION IS USED AS AN INSULATION COMPONENT

FIGURE 31

Ref. 4.2.15.1


'A' Class Fire Insulation Of The Same Or Higher Standard As The 'A' Class Bulkhead Or Deck. The Insulation Is To Be Attached To The Spigot, Damper, And Ducting By Steel Pins, Expanded Metal, And Spring Steel Washers
*
'A' Class Steel Bulkhead Or Deck
Steel Spigot
**
380mm
Vent Duct
Vent Duct
Steel Collar Of 5mm Min. Thk To Be Welded To Bulkhead Or Deck And Spigot
100mm Typ.
Fire Damper
***
450mm
450mm

SINGLE DAMPER

* Where Vents Pass Through A–0 Standard Bulkheads Or Decks The Insulation Is Not Required

** Spigot Thickness To Be As Follows:

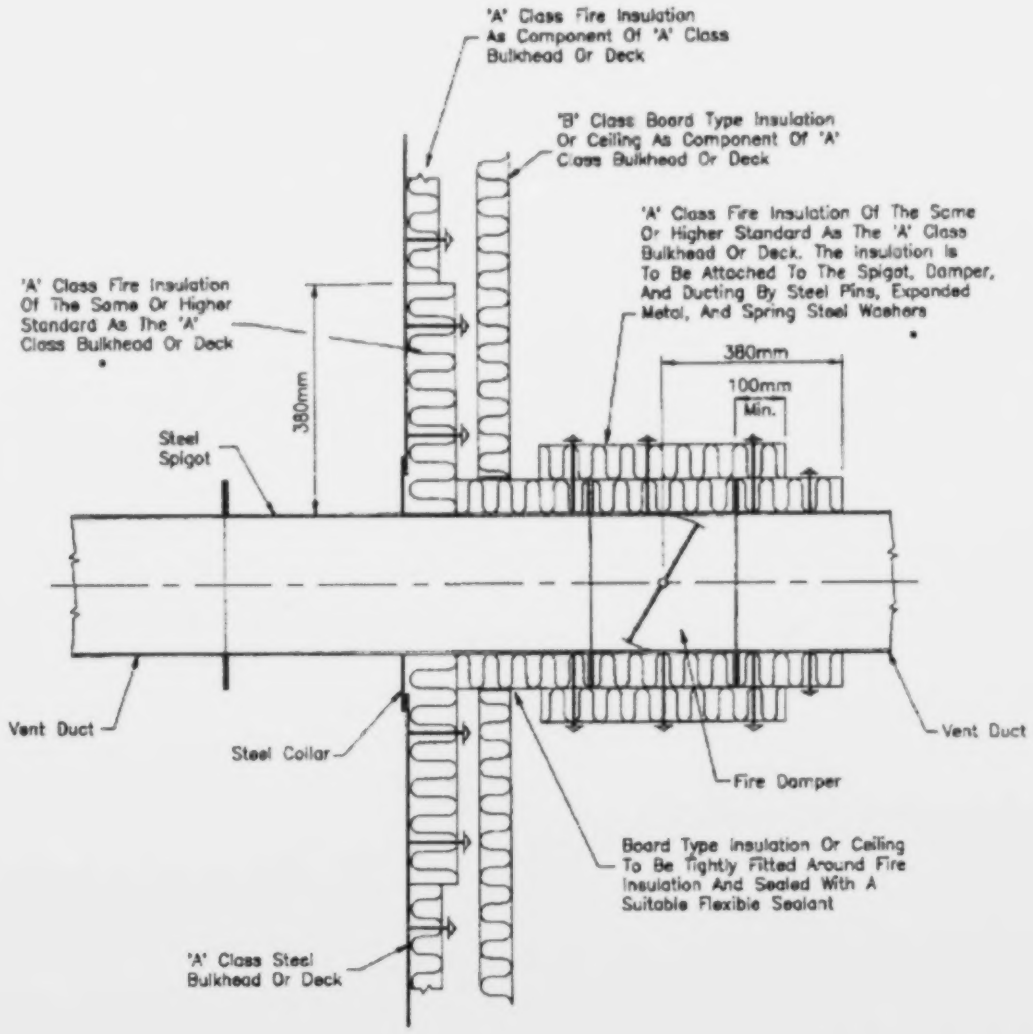
$\leq$ 1000 cm2	–	3mm
> 1000 cm2 $\leq$ 3000 cm2	–	4mm
> 3000 cm2	–	5mm

*** Damper Housing Thickness To Be In Accordance With Note **, Alternatively Damper May Be Incorporated Within Spigot Length.

PENETRATION OF 'A' CLASS BULKHEADS OR DECKS BY VENT DUCTS

FIGURE 32

Ref. 4.13.2.4
4.13.3.1
4.14.3.1

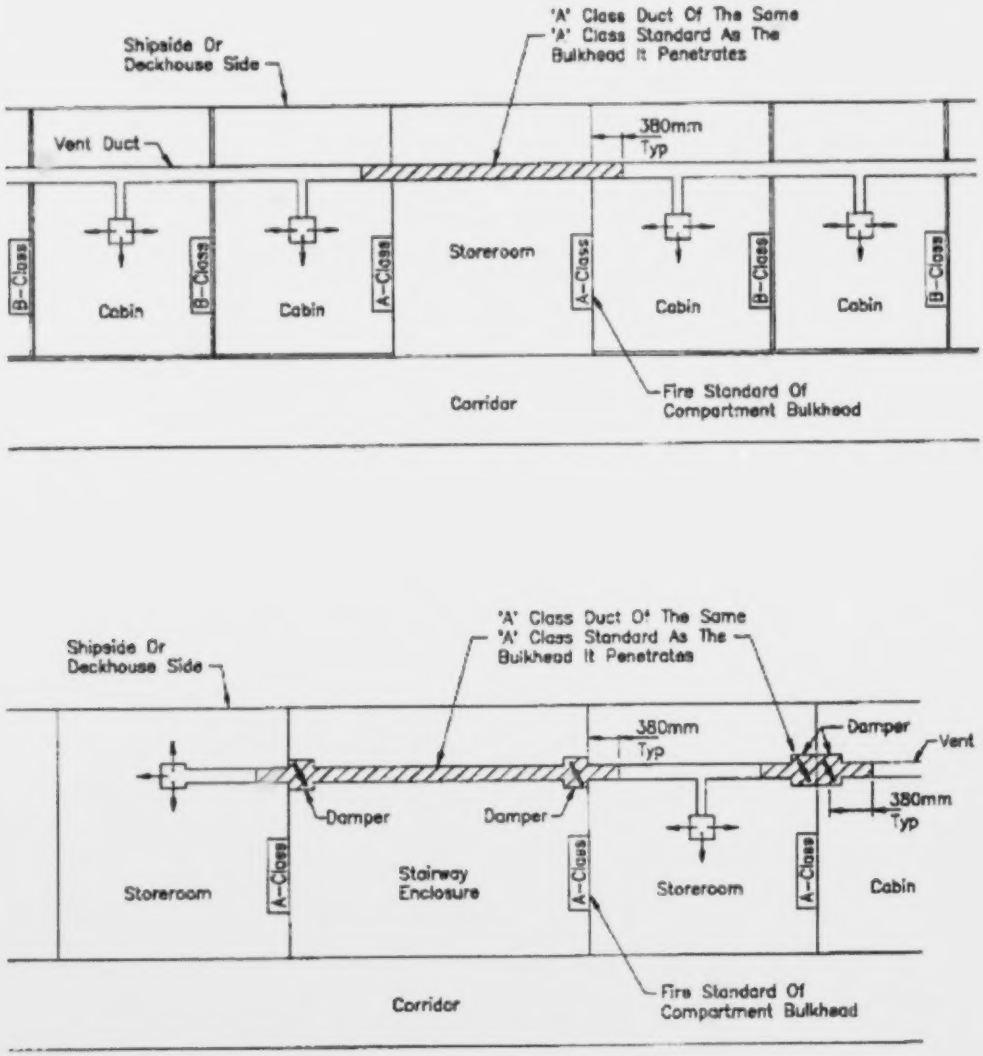


• Where Vents Pass Through A-0 Standard Bulkheads Or Decks The Insulation Is Not Required

PENETRATION OF 'A' CLASS BULKHEADS AND DECKS BY VENT DUCTS WHEN A 'B' CLASS BOARD TYPE INSULATION IS USED AS AN INSULATION COMPONENT

FIGURE 33

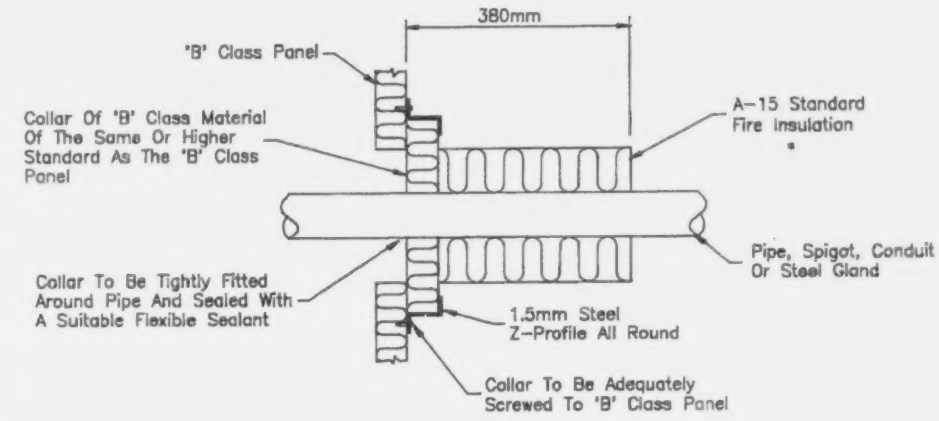
Ref. 4.13.2.4
4.13.3.1
4.14.3.1

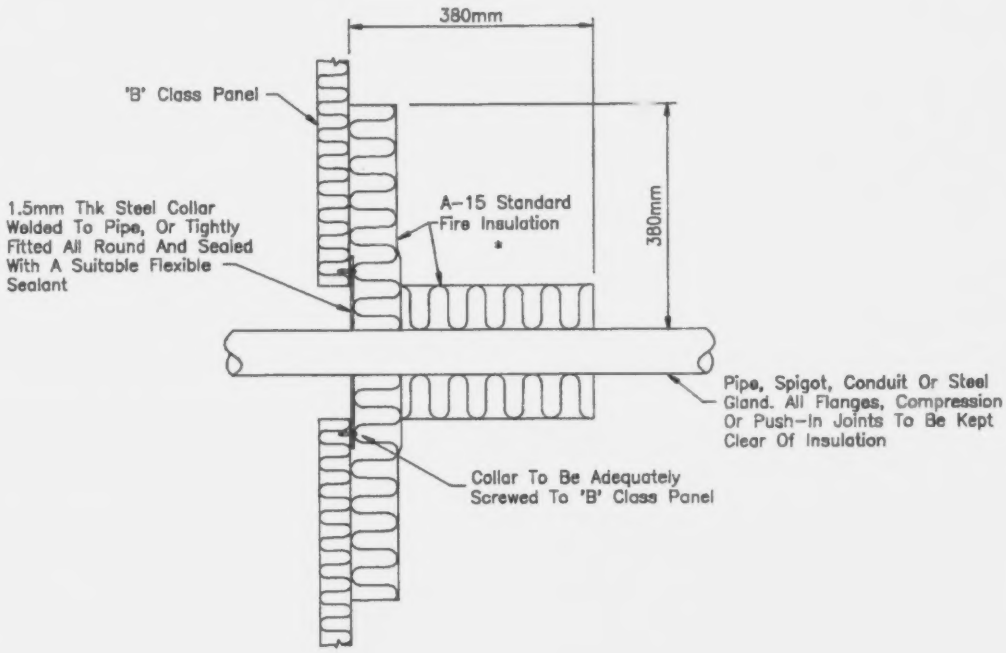


VENT DUCTS PASSING THROUGH A SPACE SURROUNDED BY 'A' CLASS DIVISIONS WITHOUT SERVING THE SPACE

FIGURE 34

Ref. 4.13.4.11
4.13.4.12
4.14.4.10


380mm
'B' Class Panel
Collar Of 'B' Class Material Of The Same Or Higher Standard As The 'B' Class Panel
A-15 Standard Fire Insulation *
Pipe, Spigot, Conduit Or Steel Gland
Collar To Be Tightly Fitted Around Pipe And Sealed With A Suitable Flexible Sealant
1.5mm Steel Z-Profile All Round
Collar To Be Adequately Screwed To 'B' Class Panel

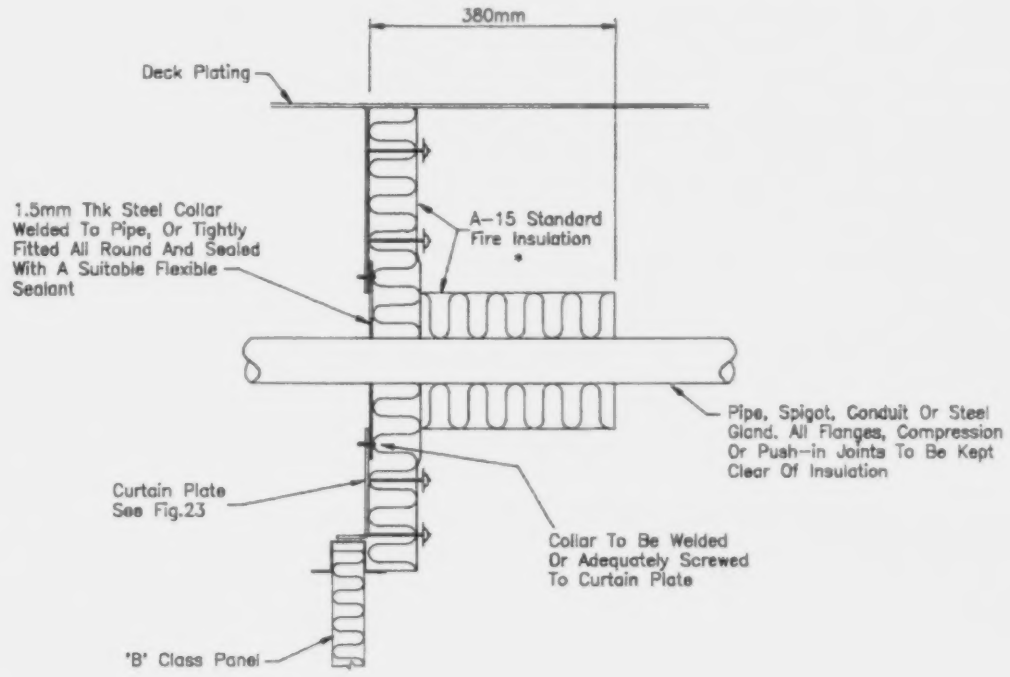

380mm
'B' Class Panel
1.5mm Thk Steel Collar Welded To Pipe, Or Tightly Fitted All Round And Sealed With A Suitable Flexible Sealant
A-15 Standard Fire Insulation *
380mm
Pipe, Spigot, Conduit Or Steel Gland. All Flanges, Compression Or Push-In Joints To Be Kept Clear Of Insulation
Collar To Be Adequately Screwed To 'B' Class Panel

* Where Pipes Pass Through B-0 Standard Bulkheads, Linings, Or Ceilings, Insulation Is Not Required

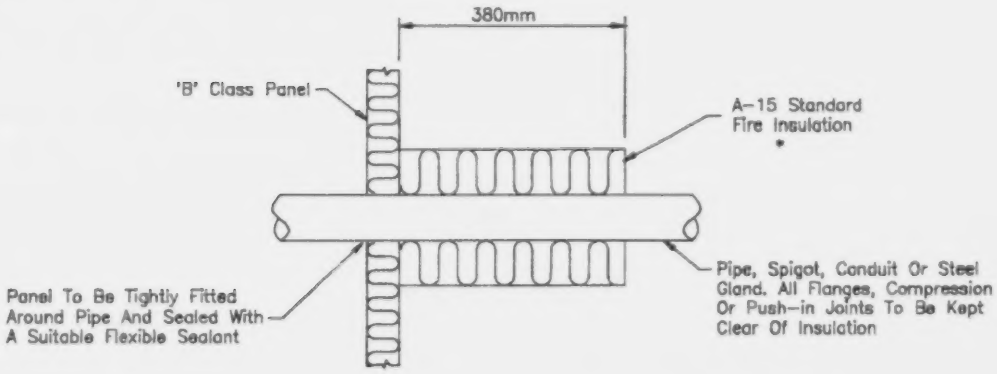
PENETRATION OF 'B' CLASS BULKHEADS, LININGS, OR CEILINGS, BY PIPES CONSTRUCTED OF STEEL OR ANY OTHER MATERIAL HAVING A MELTING POINT OF 1000° C OR MORE

FIGURE 35

Ref. 4.4.10.1


380mm
Deck Plating
1.5mm Thk Steel Collar Welded To Pipe, Or Tightly Fitted All Round And Sealed With A Suitable Flexible Sealant
A-15 Standard Fire Insulation *
Pipe, Spigot, Conduit Or Steel Gland. All Flanges, Compression Or Push-in Joints To Be Kept Clear Of Insulation
Curtain Plate See Fig.23
Collar To Be Welded Or Adequately Screwed To Curtain Plate
'B' Class Panel

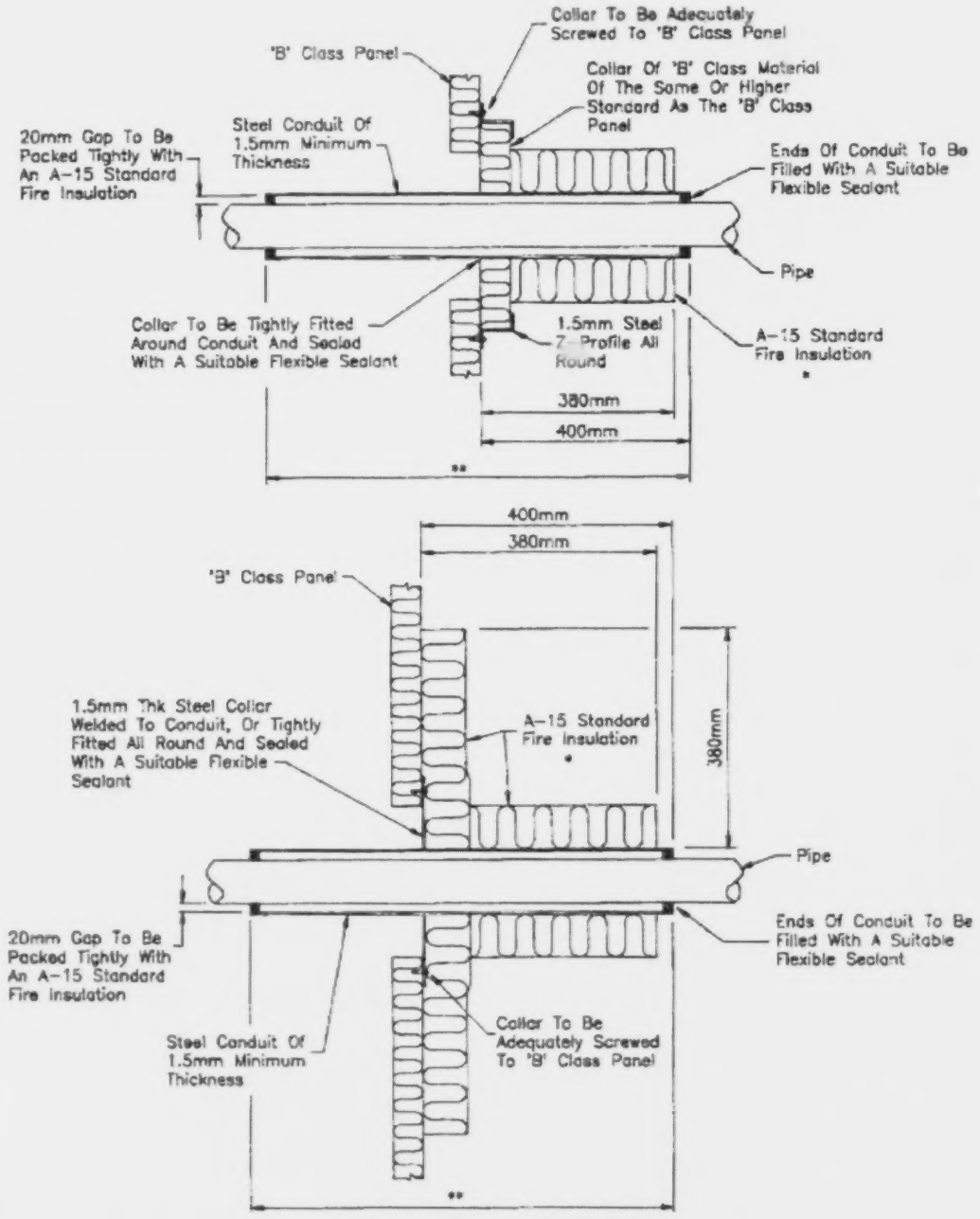
* Where Pipes Pass Through B-0 Standard Bulkheads, Linings, Or Ceilings, Insulation Is Not Required


380mm
'B' Class Panel
A-15 Standard Fire Insulation *
Pipe, Spigot, Conduit Or Steel Gland. All Flanges, Compression Or Push-in Joints To Be Kept Clear Of Insulation
Panel To Be Tightly Fitted Around Pipe And Sealed With A Suitable Flexible Sealant

PENETRATION OF 'B' CLASS BULKHEADS, LININGS, OR CEILINGS, BY PIPES CONSTRUCTED OF STEEL OR ANY OTHER MATERIAL HAVING A MELTING POINT OF 1000° C OR MORE

FIGURE 36

Ref. 4.4.10.1


Collar To Be Adequately Screwed To 'B' Class Panel
'B' Class Panel
Collar Of 'B' Class Material Of The Same Or Higher Standard As The 'B' Class Panel
20mm Gap To Be Packed Tightly With An A-15 Standard Fire Insulation
Steel Conduit Of 1.5mm Minimum Thickness
Ends Of Conduit To Be Filled With A Suitable Flexible Sealant
Pipe
Collar To Be Tightly Fitted Around Conduit And Sealed With A Suitable Flexible Sealant
1.5mm Steel Z Profile All Round
A-15 Standard Fire Insulation
*
380mm
400mm
**
400mm
380mm
'B' Class Panel
1.5mm Thk Steel Collar Welded To Conduit, Or Tightly Fitted All Round And Sealed With A Suitable Flexible Sealant
A-15 Standard Fire Insulation
*
380mm
Pipe
Ends Of Conduit To Be Filled With A Suitable Flexible Sealant
20mm Gap To Be Packed Tightly With An A-15 Standard Fire Insulation
Steel Conduit Of 1.5mm Minimum Thickness
Collar To Be Adequately Screwed To 'B' Class Panel
**

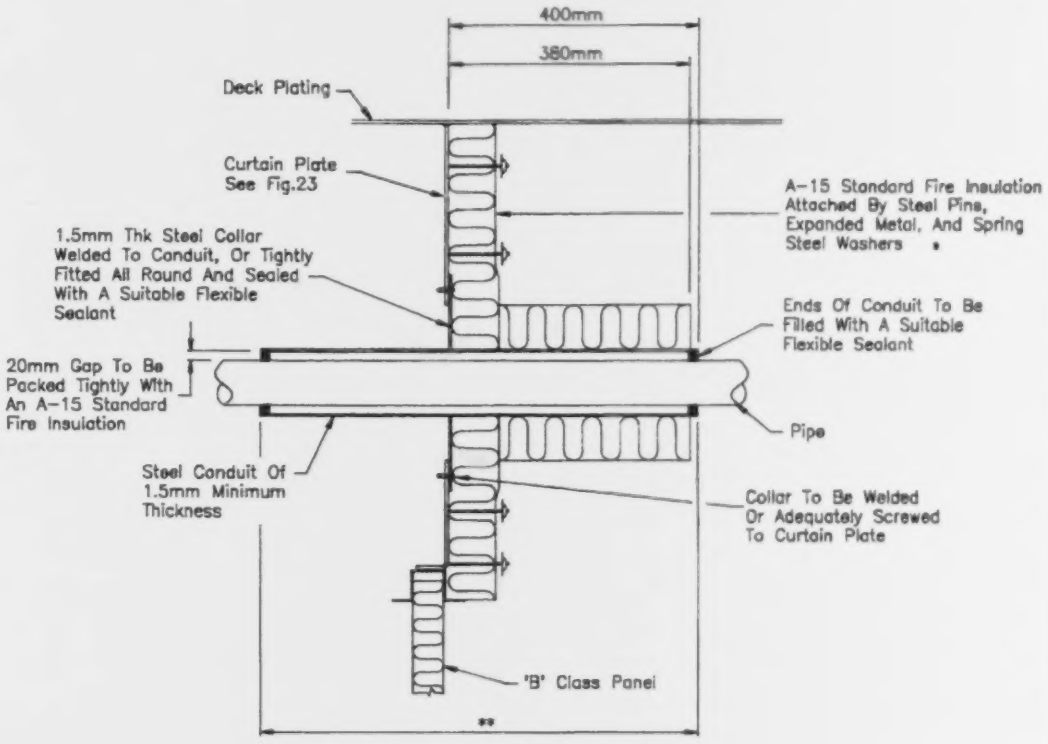
* Where Pipes Pass Through B-0 Standard Bulkheads, Linings, Or Ceilings, Insulation is Not Required

** Length Of Conduit To Be As Indicated In 4.4.10.2

PENETRATION OF 'B' CLASS BULKHEADS, LININGS, OR CEILINGS, BY PIPES CONSTRUCTED FROM A MATERIAL HAVING A MELTING POINT LESS THAN 1000° C

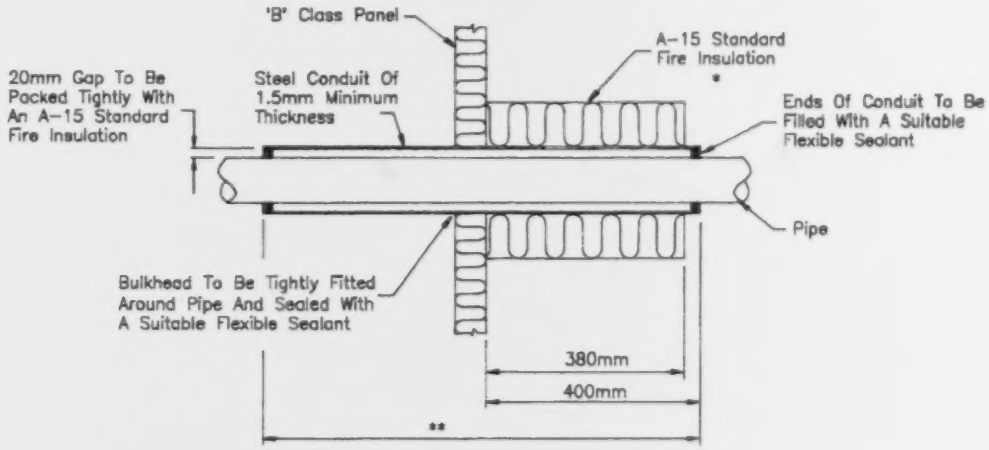
FIGURE 37

Ref. 4.4.10.2



* Where Pipes Pass Through B-0 Standard Bulkheads, Linings, Or Ceilings, Insulation Is Not Required

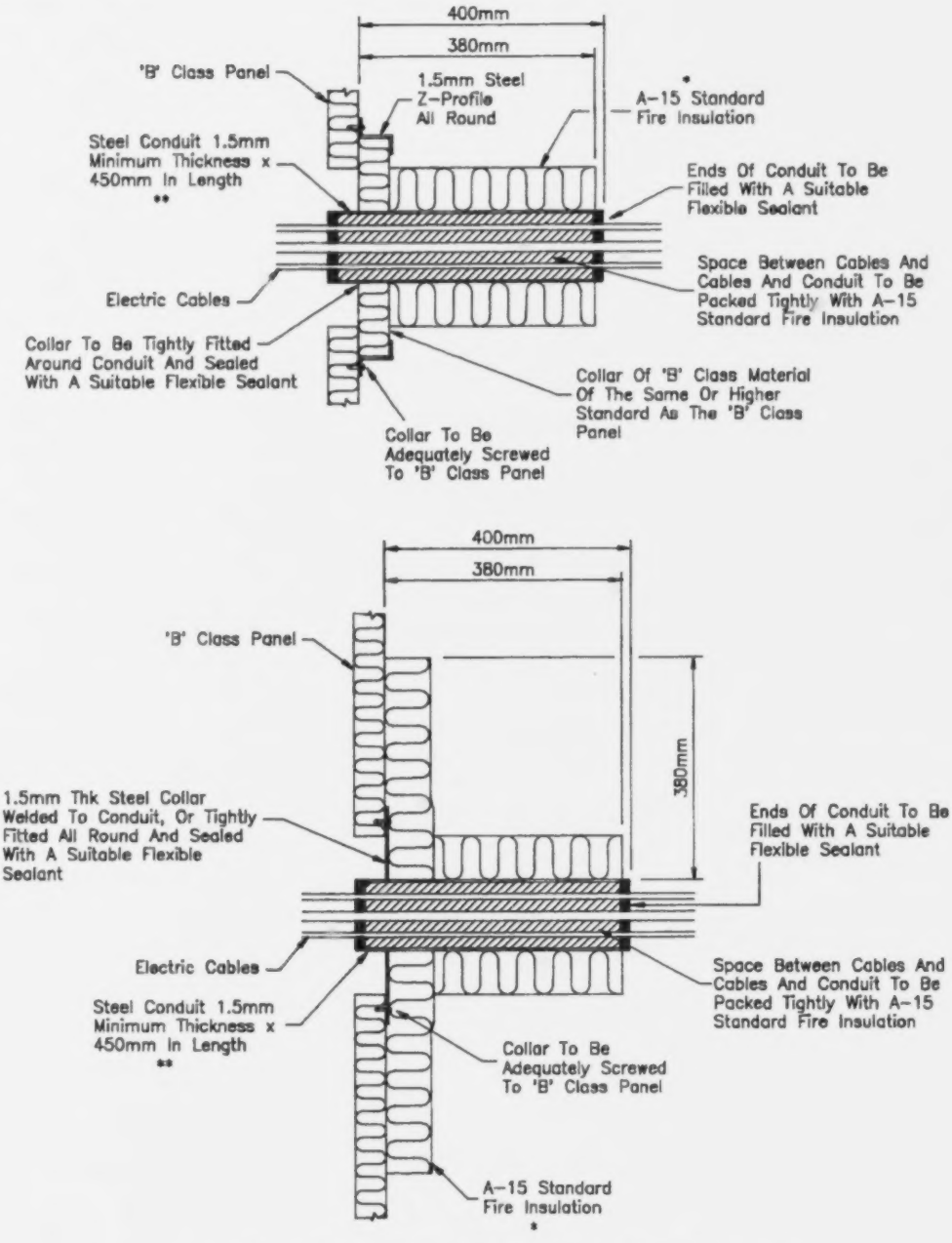
** Length Of Conduit To Be As Indicated In 4.4.10.2



PENETRATION OF 'B' CLASS BULKHEADS, LININGS, OR CEILINGS, BY PIPES CONSTRUCTED FROM A MATERIAL HAVING A MELTING POINT LESS THAN 1000° C

FIGURE 38

Ref. 4.4.10.2


400mm
380mm
'B' Class Panel
1.5mm Steel Z-Profile All Round
A-15 Standard Fire Insulation *
Steel Conduit 1.5mm Minimum Thickness x 450mm In Length **
Ends Of Conduit To Be Filled With A Suitable Flexible Sealant
Space Between Cables And Cables And Conduit To Be Packed Tightly With A-15 Standard Fire Insulation
Electric Cables
Collar To Be Tightly Fitted Around Conduit And Sealed With A Suitable Flexible Sealant
Collar Of 'B' Class Material Of The Same Or Higher Standard As The 'B' Class Panel
Collar To Be Adequately Screwed To 'B' Class Panel
400mm
380mm
'B' Class Panel
380mm
1.5mm Thk Steel Collar Welded To Conduit, Or Tightly Fitted All Round And Sealed With A Suitable Flexible Sealant
Ends Of Conduit To Be Filled With A Suitable Flexible Sealant
Electric Cables
Space Between Cables And Cables And Conduit To Be Packed Tightly With A-15 Standard Fire Insulation
Steel Conduit 1.5mm Minimum Thickness x 450mm In Length **
Collar To Be Adequately Screwed To 'B' Class Panel
A-15 Standard Fire Insulation *

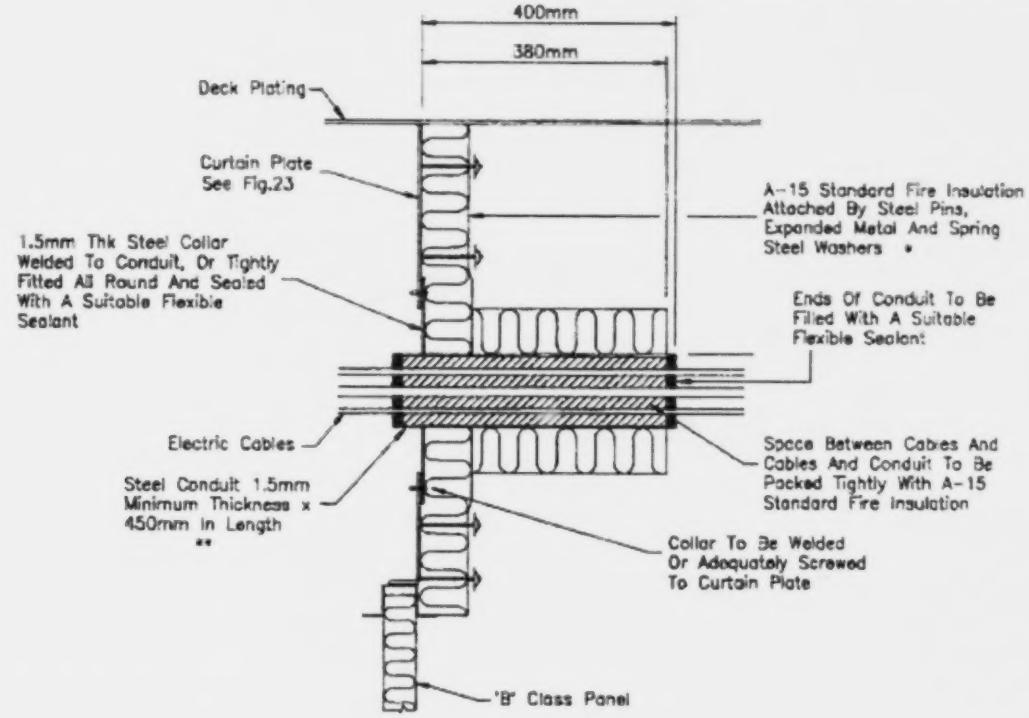
* Where Cables Pass Through B-0 Standard Bulkheads, Linings, Or Ceilings Insulation Is Not Required

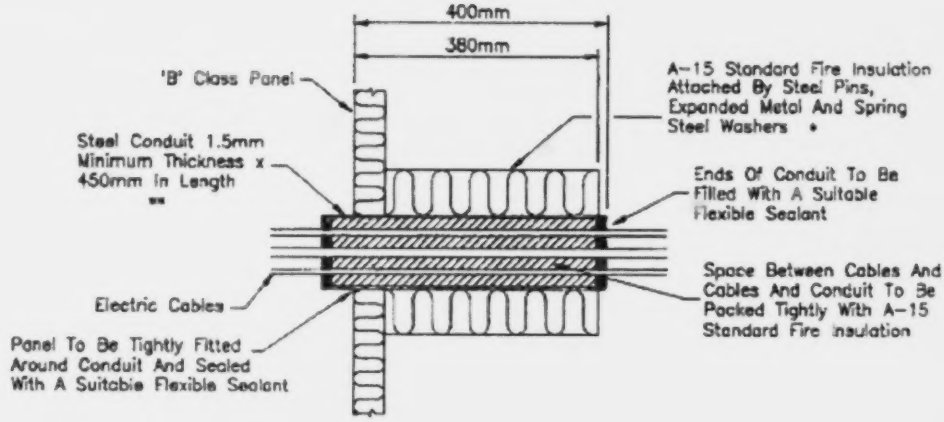
** When Bulkheads, Linings, Or Ceilings Are B-0 Standard The Conduit Is To Be 380mm In Length And Spaced Equally Both Sides Of Division

PENETRATION OF 'B' CLASS BULKHEADS, LININGS, OR CEILINGS BY ELECTRIC CABLES

FIGURE 39

Ref. 4.4.11.4





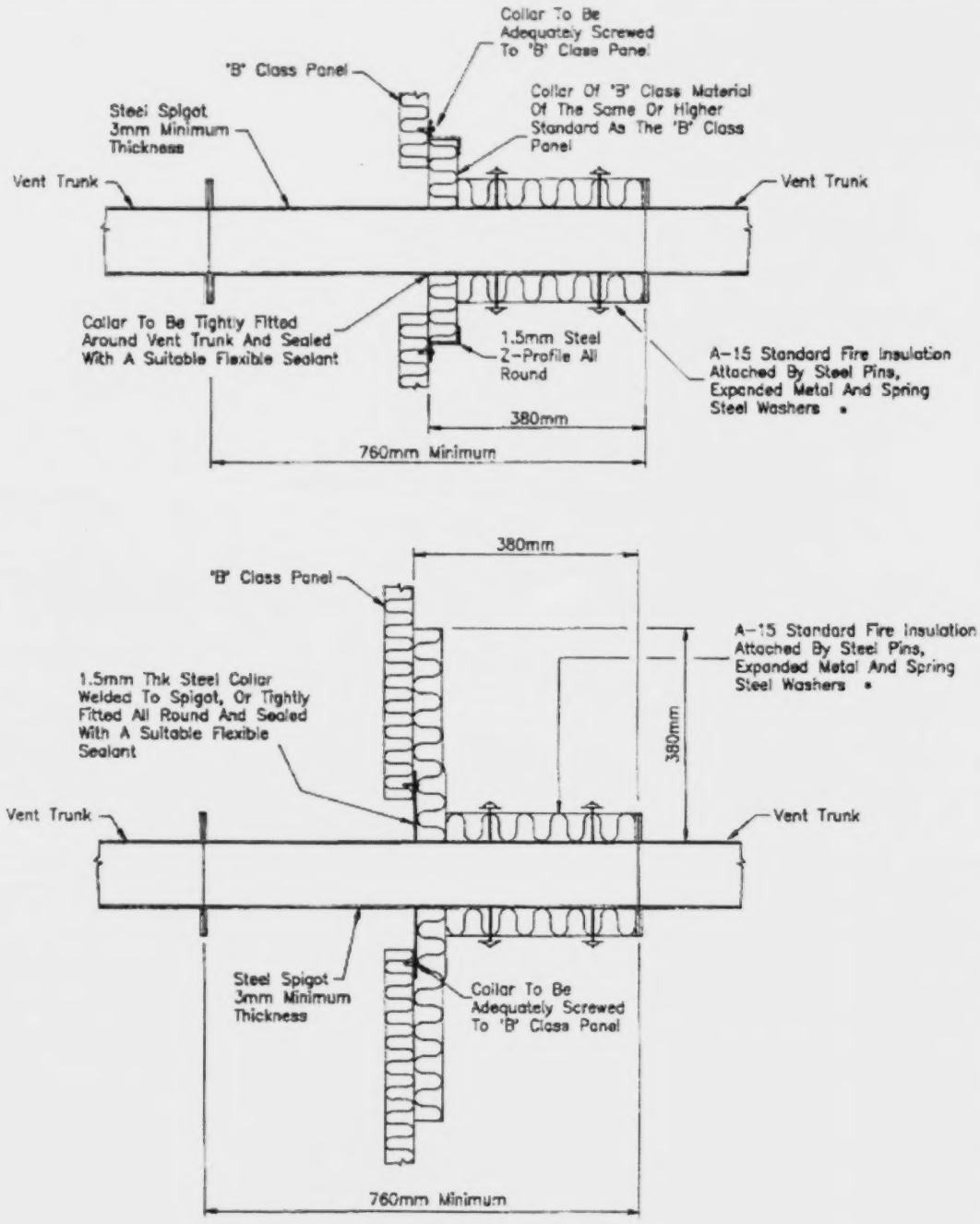
* Where Cables Pass Through B-0 Standard Bulkheads, Linings, Or Ceilings Insulation Is Not Required

** When Bulkheads, Linings, Or Ceilings Are B-0 Standard The Conduit Is To Be 380mm In Length And Spaced Equaly Both Sides Of Division

PENETRATION OF 'B' CLASS BULKHEADS, LININGS, OR CEILINGS BY ELECTRIC CABLES

FIGURE 40

Ref. 4.4.11.4

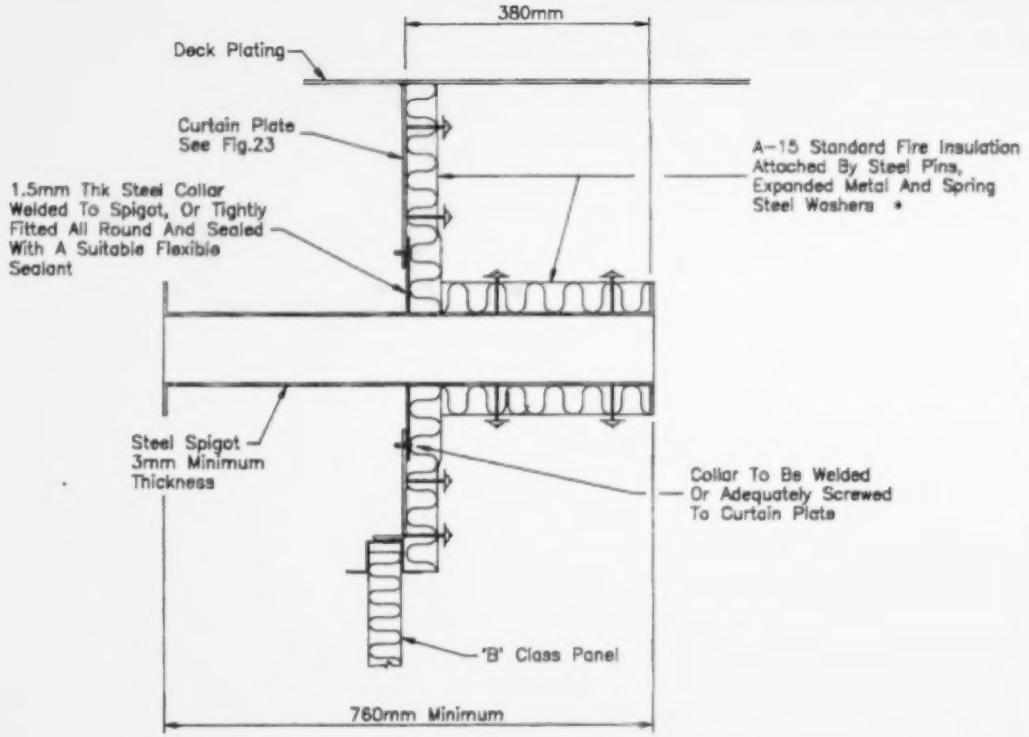

Collar To Be Adequately Screwed To 'B' Class Panel
'B' Class Panel
Collar Of 'B' Class Material Of The Same Or Higher Standard As The 'B' Class Panel
Steel Spigot 3mm Minimum Thickness
Vent Trunk
Vent Trunk
Collar To Be Tightly Fitted Around Vent Trunk And Sealed With A Suitable Flexible Sealant
1.5mm Steel Z-Profile All Round
A-15 Standard Fire Insulation Attached By Steel Pins, Expanded Metal And Spring Steel Washers *
380mm
760mm Minimum
380mm
'B' Class Panel
A-15 Standard Fire Insulation Attached By Steel Pins, Expanded Metal And Spring Steel Washers *
1.5mm Thk Steel Collar Welded To Spigot, Or Tightly Fitted All Round And Sealed With A Suitable Flexible Sealant
380mm
Vent Trunk
Vent Trunk
Steel Spigot 3mm Minimum Thickness
Collar To Be Adequately Screwed To 'B' Class Panel
760mm Minimum

* Where Vent Trunks Pass Through B-0 Standard Bulkheads, Linings, Or Ceilings Insulation Is Not Required

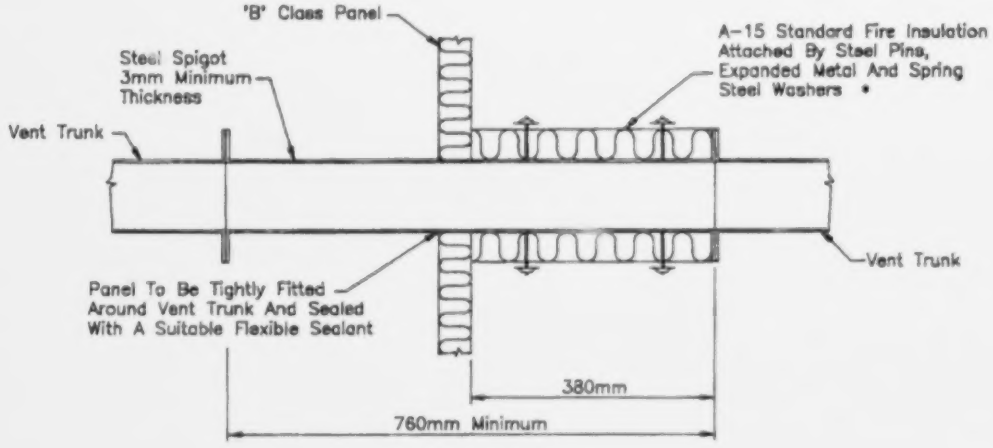
PENETRATION OF 'B' CLASS BULKHEADS, LININGS, OR CEILINGS BY VENT DUCTS

FIGURE 41

Ref. 4.13.3.3



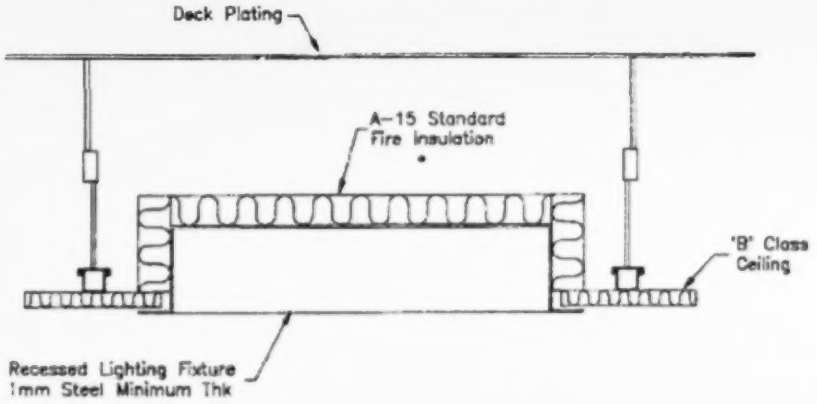
• Where Vent Trunks Pass Through B-0 Standard Bulkheads, Linings, Or Ceilings Insulation Is Not Required



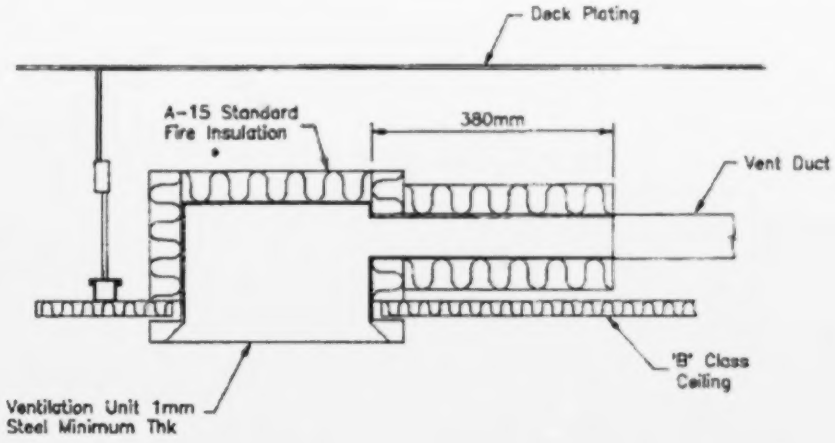
PENETRATION OF 'B' CLASS BULKHEADS, LININGS, OR CEILINGS BY VENT DUCTS

FIGURE 42

Ref. 4.13.3.3



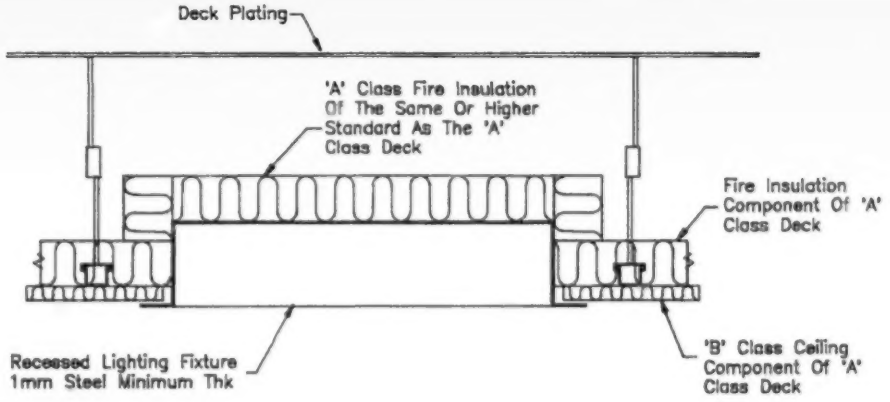
* Where Lighting And Ventilation Fixtures Are Fitted In B-0 Standard Ceilings Insulation Is Not Required

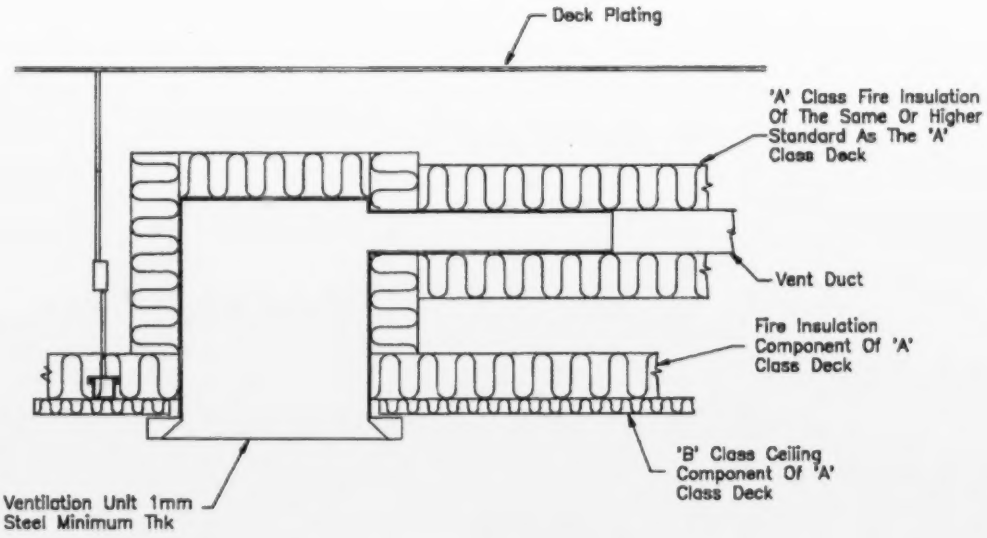


PENETRATION OF 'B' CLASS CEILINGS BY LIGHTING AND VENTILATION FITTINGS WHEN THE CEILING IS NOT A COMPONENT OF AN 'A' CLASS DECK

FIGURE 43

Ref. 4.4.8.1

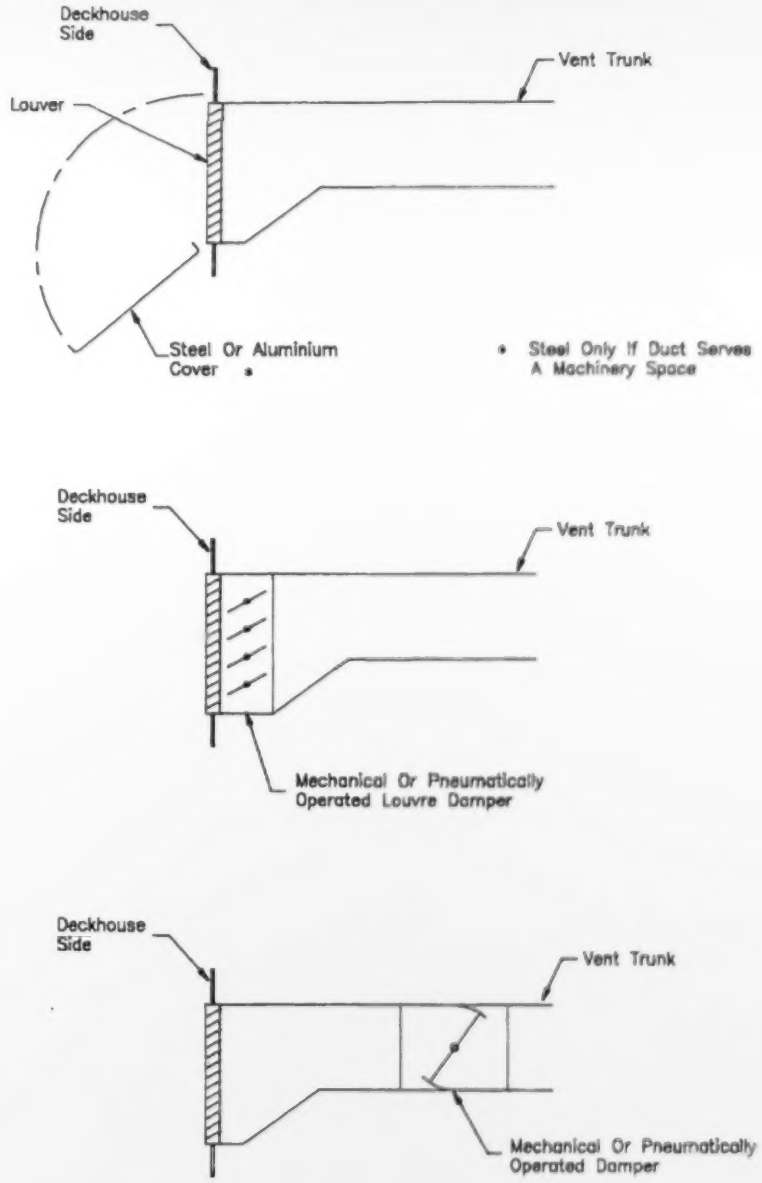

Deck Plating
'A' Class Fire Insulation Of The Same Or Higher Standard As The 'A' Class Deck
Fire Insulation Component Of 'A' Class Deck
Recessed Lighting Fixture 1mm Steel Minimum Thk
'B' Class Ceiling Component Of 'A' Class Deck


Deck Plating
'A' Class Fire Insulation Of The Same Or Higher Standard As The 'A' Class Deck
Vent Duct
Fire Insulation Component Of 'A' Class Deck
'B' Class Ceiling Component Of 'A' Class Deck
Ventilation Unit 1mm Steel Minimum Thk

PENETRATION OF 'B' CLASS CEILINGS BY LIGHTING AND VENTILATION FITTINGS WHEN 'B' CLASS CEILING IS A COMPONENT OF AN 'A' CLASS DECK

FIGURE 44

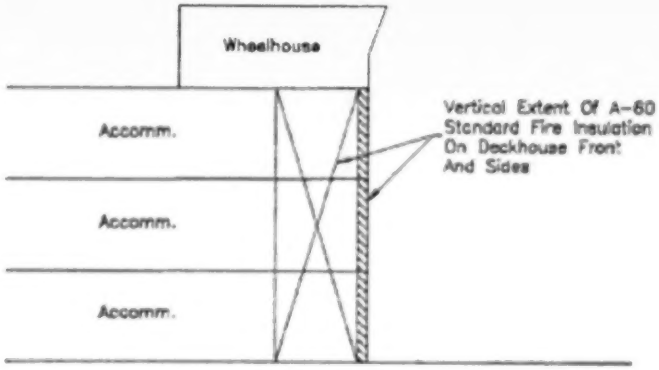
Ref. 4.4.8.1



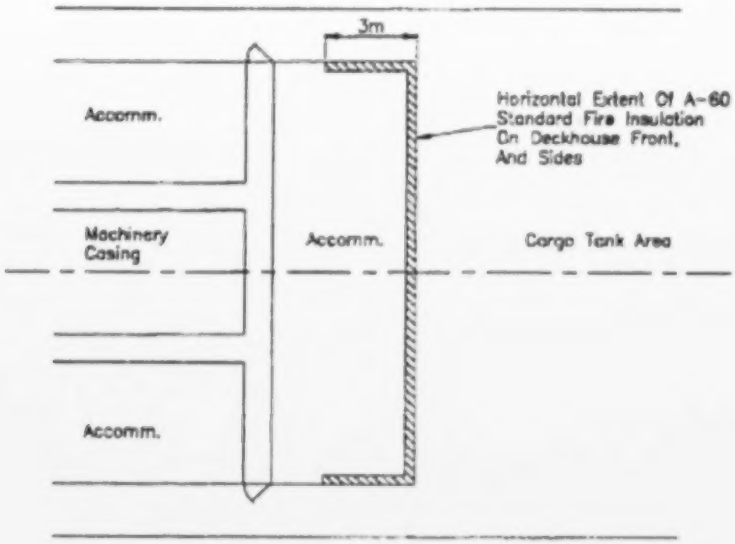
METHODS OF CLOSING MAIN INLETS AND OUTLETS OF VENTILATION SYSTEMS

FIGURE 45

Ref. 4.13.5.1
4.14.5.1



ELEVATION

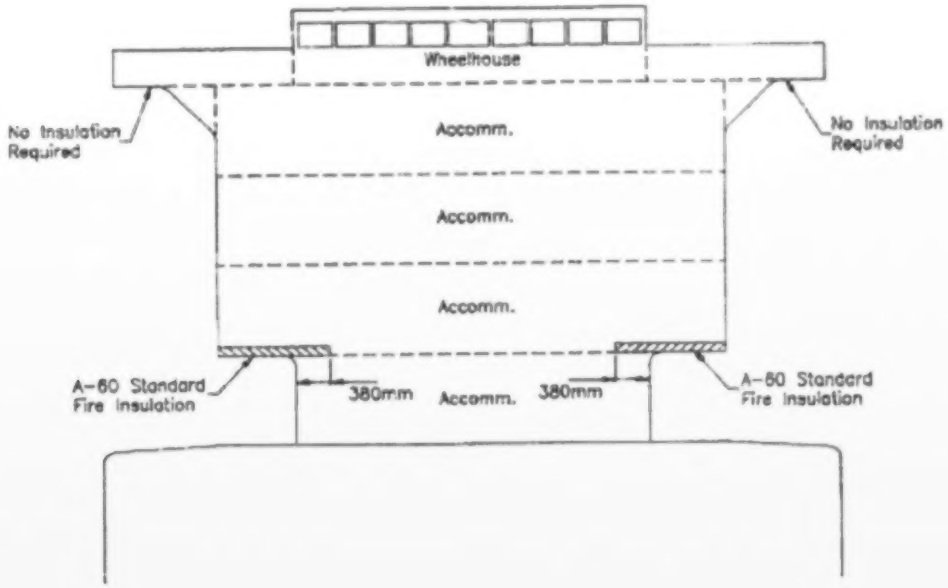


PLAN

EXTENT OF INSULATION ON SUPERSTRUCTURE OR DECKHOUSE FACING CARGO TANK AREA

FIGURE 46

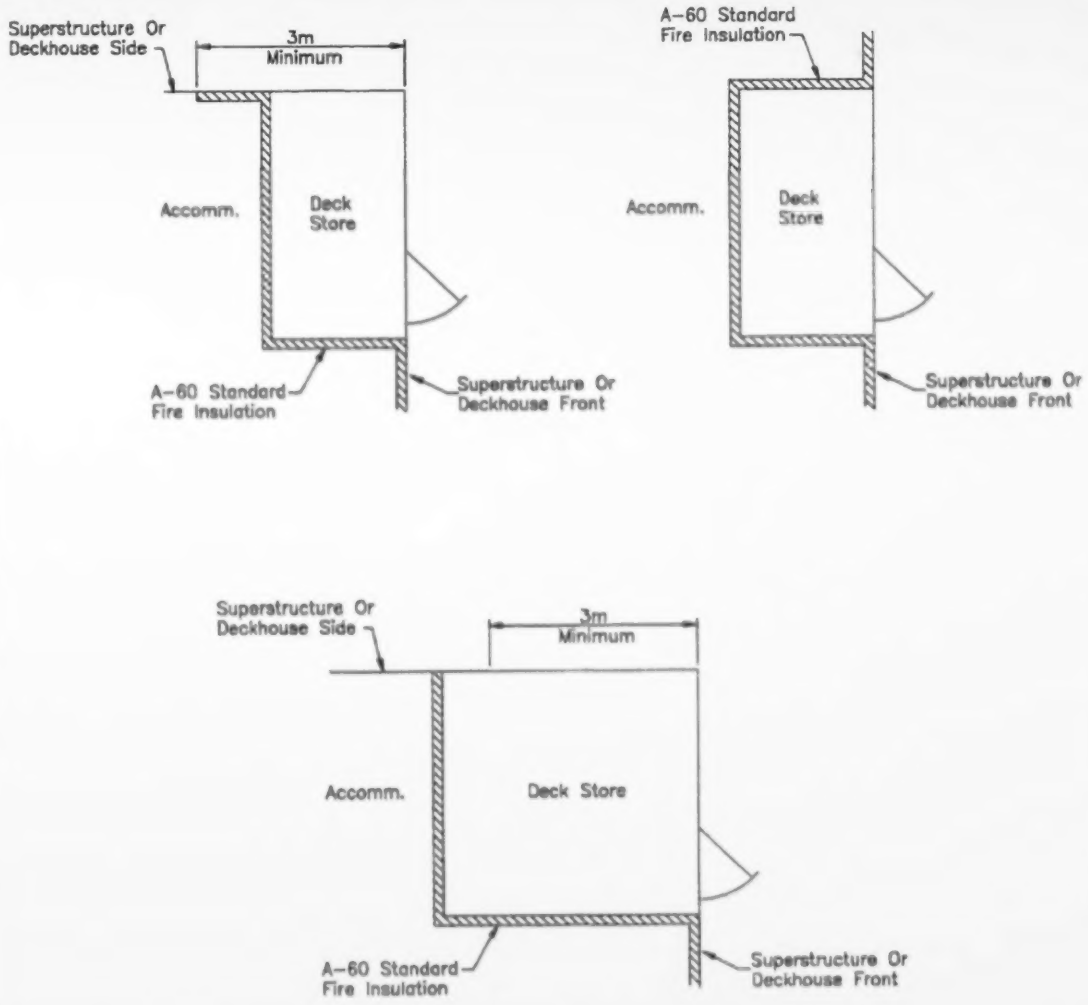
Ref. 4.26.3



INSULATION OF AN OVERHANGING DECK

FIGURE 47

Ref. 4.26.4



In All Cases The Deckhead Of The Space Should Be Insulated

EXTENT OF INSULATION AROUND A SPACE WHICH IS PERMITTED TO HAVE ACCESS WITHIN THE AREA SPECIFIED IN 4.26.6

FIGURE 48

Ref. 4.26.7